NEPTUNE 5 FA

Nilfisk ALTO

Why Compromise

Service Manual

NEPTUNE 5 FA_EN_Ver.2.0_25/11

Preface

This service manual contains detailed description of the main repair work on the hot HPW NEPTUNE 5.

Repair work requires a suitable testing workplace with the necessary water and power supply.

If operating errors are evident, refer the customer to the operating instructions.

A fault in the cleaner can have several causes as described in the section on troubleshooting.

Refer to the illustrated spare parts lists during repairs. They show the assembly position and the sequence in which the individual components should be assembled.

See ”Service Technical Information” (STI) sheets. They include information on technical modifications that have been made after this repair manual was printed.

”Service Technical Information” sheets are also valid as a supplement to the spare parts list until publication of a new edition.

Repair manuals and ” Service Technical Information” sheets should be available at the site where repairs are carried out.

It is not permitted to give them to third parties.

Use original Nilfisk-ALTO spare parts only.

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For your own safety

Repair work should be carried out by persons instructed in electrical installations or by trained electricians only.

Observe valid safety regulations for electrical equipment. In particular, observe the following regulations:
IEC 60335-2-79
EN 60335-2-79

Additionally:
Also see national regulations

Before using the cleaner, always read the operating instructions and keep them readily available.

Only allow the high pressure cleaner to be used by persons who have been trained in its use and who have been explicitly authorized to use it.

ESD measures (electrostatic discharge)

Take the following ESD precautions before carrying out any repairs to the electronics:

- Touch the earth conductor before repairing the cleaner (to discharge electrostatic charge from your body).
- Wear wrist band if necassary.
- Use a conductive floor covering or a conductive table cover.
- Never touch the printed circuit board or electronic components (always hold on to plastic).
- Transport electronic components in conductive packaging (e.g. ESD bag).

NEPTUNE 5 FA							
Description		5-50FA EU 400V/3 ~50Hz 16A			5-50FAX EU 400V/3 ~50Hz 16A		
Item no.	Tol.	107146650			107146651		
Technical data		Test result	Tol.+	Tol.-	Test result	Tol.+	Tol.-
Pump-Data							
Max. inlet pressure (bar)		10,0			10,0		
Max. Inlet temperature (°C)		40,0			40,0		
Pressure at pump head	0	175	10	10	180	10	10
Pressure @ Cylinder Head (bar)	0	180	10	10	185	10	10
Pressure @ Outlet (bar)	0	163	9	9	166	9	9
Pressure @ Gun (bar)	0	140	8	8	144	8	8
Pressure cut off @ Cylinder Head (bar)		200	5	5	205	5	5
Pressure Pmax safety valve @ Cylinder Head (bar)		250,0	5,0	5,0	250,0	5,0	5,0
Flow. Qiec (l/min)	2,5%	13,6	0,3	0,3	13,6	0,3	0,3
Flow. Qmax (l/min)	5%	14,6	0,7	0,7	14,6	0,7	0,7
Flow. Qmin, steam (l/min)	3%	6,3	0,2	0,2	6,3	0,2	0,2
Type		NA5			NA5		
Piston type		Cermic			Cermic		
Piston diameter (mm)		20,0			20,0		
Stroke / Wobble disc angle		10,2			10,2		
Pump oil type		Oil BP Energol GR-XP220			Oil BP Energol GR-XP220		
Oil volume (l)		0,8			0,8		
Electrical							
Power supply		400V/3~/50Hz			400V/3~/50Hz		
Current consump. - hot (A)		12,2	1,0	3,0	12,3	1,0	3,0
Current consump. - cold (A)		12,4	1,0	3,0	12,5	1,0	3,0
Power Consumption - hot (kW)		6,0	0,5	0,5	6,1	0,5	0,5
Fuse size (A)		16,0			16,0		
Cord type		H07RN-F 4G1,5 x 6m			H07RN-F 4G1,5 x 6m		
Plug type		CEE 3P+N+G / 16A			CEE 3P+N+G / 16A		
Control		PCB 24 volt			PCB 24 volt		
Contactor		100-C16KJ10 24			100-C16KJ10 24		
Electrical diagram		106427171			106427171		
Eletrical test data							
Highvoltage (HV) test (V)		1000 Vac			1000 Vac		
HV-Resistance (MΩ)		≥ 1MΩ / 500Vdc			≥ 1MΩ / 500Vdc		
Cord-resistance (Ohm)		0,2			0,2		
Motor-Data							
Motortype		3~ Induction			3~ Induction		
Rotational speed (min-1)		1450			1450		
Insulation		Class F			Class F		
Protection Class		IP 54			IP 54		
Nominal power [kW]		5,5	3,0	3,0	5,5	3,0	3,0
Cos j		0,7			0,7		

NEPTUNE 5 FA							
Description		5-50FA EU 400V/3 ~50Hz 16A			5-50FAX EU 400V/3 ~50Hz 16A		
Item no.	Tol.	107146650			107146651		
Technical data Heating Unit		Test result	Tol.+	Tol.-	Test result	Tol.+	Tol.-
Boilerpower_input (kW)		78,0			78,0		
Temperature t max, @ inlet 12°C		87,7	0,0	3,0	87,7	0,0	3,0
Delta temp. variance at 50 °C set point, at @ gun (°C)		30,0	0,0	3,0	30,0	0,0	3,0
Boiler on time at 50 °C set point, @ inlet 12° (sec)		30,0	5,0	5,0	30,0	5,0	5,0
Steam temp. t II @ outlet and v. Steam nozzle(°C)		140,0	10,0	30,0	140,0	10,0	30,0
Pressure P2 @ outlet with standard nozzle (bar)		27,0	5,0	5,0	27,0	5,0	5,0
Fuel pump type		Diesel			Diesel		
Oil pressure (bar)		10,0	0,5	0,0	10,0	0,5	0,0
Nozzle size, oil		1,75 60°H			1,75 60°H		
CO2 content min (%)		10,5	0,5	0,0	10,5	0,5	0,0
Efficiency burner (%)		92,0	1,5	0,5	92,0	1,5	0,5
Soot picture		0-1			0-1		
Exhaust outlet temperature (°C)		175,0	10,0	10,0	175,0	10,0	10,0
Exhaust temperature, cut off (°C)		270,0	0,0	12,0	270,0	0,0	12,0
Fuel consump. @ dT=45 deg(kg/h)		4,0			4,0		
Fuel consumption (kg/h) @ 12°C inlet		6,7			6,7		
Water volume in coil (l)		4,8			4,8		
Fuel tank (l)		17,0					
Others							
Gun		ST ERGO 2000			ST ERGO 2000		
Lance		TORNADO PLUS			TORNADO PLUS		
Hose		DN 8x10m 3/8"			DN 8x20m		
High Pressure Nozzle		NT 0500			NT 0500		
Noise level 1m Lpa(dBA)		76,6	1,5	1,5	76,6	1,5	1,5
Noisepower LWA (dB) A		93,0	1,5	1,5	93,0	1,5	1,5
Impact force	N	44,0			45,0		
Vibration ISO 5349 (m/s²)		≤ 2,5			≤ 2,5		
Protection Class		IP X5			IP X5		
Max detergent flow from full internal tank (%)		4,0	1,0	1,0	4,0	1,0	1,0
Max detergent flow from full internal tank (L/min)		0,5	0,2	0,2	0,5	0,2	0,2

NEPTUNE 5 FA							
Description		SB FA EU 400V/3 ~50Hz 10A			5-61FA EU 400V/3 ~50 16A		
Item no.	Tol.	107146652			107146653		
Technical data		Test result	Tol.+	Tol.-	Test result	Tol.+	Tol.-
Pump-Data							
Max. inlet pressure (bar)		10,0			10,0		
Max. Inlet temperature (°C)		40,0			40,0		
Pressure at pump head	0	75	4	4	190	10	10
Pressure @ Cylinder Head (bar)	0	80	4	4	195	11	11
Pressure @ Outlet (bar)	0	72	4	4	193	11	11
Pressure @ Gun (bar)	0	67	4	4	168	9	9
Pressure cut off @ Cylinder Head (bar)		100	5	5	215	5	5
Pressure Pmax safety valve @ Cylinder Head (bar)		120,0	5,0	5,0	250,0	5,0	5,0
Flow. Qiec (l/min)	2,5%	12,1	0,3	0,3	15,8	0,4	0,4
Flow. Qmax (l/min)	5%	13,1	0,7	0,7	16,9	0,8	0,8
Flow. Qmin, steam (l/min)	3%	5,6	0,2	0,2	9,2	0,3	0,3
Type		NA5			NA5		
Piston type		Cermic			Cermic		
Piston diameter (mm)		20,0			20,0		
Stroke / Wobble disc angle		9,2			12,0		
Pump oil type		Oil BP Energol GR-XP220			Oil BP Energol GR-XP220		
Oil volume (l)		0,8			0,8		
Electrical							
Power supply		400V/3~/50Hz			400V/3~/50Hz		
Current consump. - hot (A)		8,0	1,0	3,0	15,4	1,0	3,0
Current consump. - cold (A)		8,2	1,0	3,0	16,0	1,0	3,0
Power Consumption - hot (kW)		4,1	0,5	0,5	7,6	0,5	0,5
Fuse size (A)		16,0			16,0		
Cord type		H07RN-F 4G1,5 x 6m			H07RN-F 4G1,5 x 6m		
Plug type		CEE 3P+N+G / 16A			CEE 3P+N+G / 16A		
Control		PCB 24 volt			PCB 24 volt		
Contactor		100-C12KJ10 5,5kW			100-C16KJ10 24		
Electrical diagram		106427171 + 71371			106427171		
Eletrical test data							
Highvoltage (HV) test (V)		1000 Vac			1000 Vac		
HV-Resistance (MΩ)		≥ 1MΩ / 500Vdc			≥ 1MΩ / 500Vdc		
Cord-resistance (Ohm)		0,2			0,2		
Motor-Data							
Motortype		3~ Induction			3~ Induction		
Rotational speed (min-1)		1450			1450		
Insulation		Class F			Class F		
Protection Class		IP 54			IP 54		
Nominal power [kW]		3,0	3,0	3,0	6,7	3,0	3,0
Cos j		0,8			0,7		

NEPTUNE 5 FA							
Description		SB FA EU 400V/3 ~50Hz 10A			5-61FA EU 400V/3 ~50 16A		
Item no.	Tol.	107146652			107146653		
Technical data		Test result	Tol.+	Tol.-	Test result	Tol.+	Tol.-
Heating Unit							
Boilerpower_input (kW)		67,0			85,0		
Temperature t max, @ inlet 12°C		85,2	0,0	3,0	83,0	0,0	3,0
Delta temp. variance at 50 °C set point, at @ gun (°C)		30,0	0,0	3,0	30,0	0,0	3,0
Boiler on time at 50 °C set point, @ inlet 12° (sec)		30,0	5,0	5,0	30,0	5,0	5,0
Steam temp. t II @ outlet and v. Steam nozzle(°C)		140,0	10,0	30,0	140,0	10,0	30,0
Pressure P2 @ outlet with standard nozzle (bar)		27,0	5,0	5,0	27,0	5,0	5,0
Fuel pump type		Diesel			Diesel		
Oil pressure (bar)		12,0	0,5	0,0	12,0	0,5	0,0
Nozzle size, oil		1,35 60°H			1,75 60°H		
CO2 content min (%)		10,5	0,5	0,0	10,5	0,5	0,0
Efficiency burner (%)		92,0	1,5	0,5	92,0	1,5	0,5
Soot picture		0-1			0-1		
Exhaust outlet temperature (°C)		160,0	10,0	10,0	175,0	10,0	10,0
Exhaust temperature, cut off (°C)		270,0	0,0	12,0	270,0	0,0	12,0
Fuel consump. @ dT=45 deg(kg/h)		3,5	0,0	0,1	4,6		
Fuel consumption (kg/h) @ 12°C inlet		5,7	0,0	0,0	7,3		
Water volume in coil (l)		4,8			4,8		
Fuel tank (l)		17,0			17,0		
Others							
Gun		ST ERGO 2000			ST ERGO 2000		
Lance		TORNADO PLUS			TORNADO PLUS		
Hose		DN 8x10m Quick 3/8"			DN 8x10m Quick 3/8"		
High Pressure Nozzle		NT 0700			NT 0550		
Noise level 1m Lpa(dBA)		76,4	1,5	1,5	78,2	1,5	1,5
Noisepower LWA (dB) A		92,0	1,5	1,5	96,0	1,5	1,5
Impact force	N	26,0			53,0		
Vibration ISO 5349 (m/s²)		≤ 2,5			≤ 2,5		
Protection Class		IP X5			IP X5		
Max detergent flow from full internal tank (%)		4,0	1,0	1,0	4,0	1,0	1,0
Max detergent flow from full internal tank (L/min)		0,5	0,2	0,2	0,6	0,2	0,2

NEPTUNE 5 FA							
Description		5-61FAX EU 400V/3 ~50 16A			5-61FA NO 400V/230/3 ~ 50Hz 25/16A		
Item no.	Tol.	107146654			107146655		
Technical data		Test result	Tol.+	Tol.-	Test result	Tol.+	Tol.-
Pump-Data							
Max. inlet pressure (bar)		10,0			10,0		
Max. Inlet temperature (°C)		40,0			40,0		
Pressure at pump head	0	195	11	11	190	10	10
Pressure @ Cylinder Head (bar)	0	200	11	11	195	11	11
Pressure @ Outlet (bar)	0	197	11	11	193	11	11
Pressure @ Gun (bar)	0	170	9	9	168	9	9
Pressure cut off @ Cylinder Head (bar)		220	5	5	215	5	5
Pressure Pmax safety valve @ Cylinder Head (bar)		250,0	5,0	5,0	250,0	5,0	5,0
Flow. Qiec (l/min)	2,5%	15,8	0,4	0,4	15,8	0,4	0,4
Flow. Qmax (l/min)	5%	16,9	0,8	0,8	16,9	0,8	0,8
Flow. Qmin, steam (l/min)	3%	9,3	0,3	0,3	9,2	0,3	0,3
Type		NA5			NA5		
Piston type		Cermic			Cermic		
Piston diameter (mm)		20,0			20,0		
Stroke / Wobble disc angle		12,0			12,0		
Pump oil type		Oil BP Energol GR-XP220			Oil BP Energol GR-XP220		
Oil volume (l)		0,8			0,8		
Electrical							
Power supply		400V/3~/50Hz			400/230V/3~/50Hz		
Current consump. - hot (A)		15,8	1,0	3,0	15,6 / 25	1,0	3,0
Current consump. - cold (A)		16,0	1,0	3,0	15,8 / 25	1,0	3,0
Power Consumption - hot (kW)		7,8	0,5	0,5	7,6 / 7,4	0,5	0,5
Fuse size (A)		16,0			28 / 16		
Cord type		H07RN-F 4G1,5 x 6m			H07RN-F 4G2,5x6,0		
Plug type		CEE 3P+N+G / 16A			-		
Control		PCB 24 volt			PCB 24 volt		
Contactor		100-C16KJ10 24			100-C23KJ10		
Electrical diagram		106427171			106427177		
Eletrical test data							
Highvoltage (HV) test (V)		1000 Vac			1000 Vac		
HV-Resistance (MΩ)		≥ 1MΩ / 500Vdc			≥ 1MΩ / 500Vdc		
Cord-resistance (Ohm)		0,2			0,2		
Motor-Data							
Motortype		3~ Induction			3~ Induction		
Rotational speed (min-1)		1450			1450		
Insulation		Class F			Class F		
Protection Class		IP 54			IP 54		
Nominal power [kW]		6,7	3,0	3,0	6,7	3,0	3,0
Cos j		0,7			0,8		

NEPTUNE 5 FA							
Description		5-61FAX EU 400V/3 ~50 16A			5-61FA NO 400V/230/3 ~ 50Hz 25/16A		
Item no.	Tol.	107146654			107146655		
Technical data		Test result	Tol.+	Tol.-	Test result	Tol.+	Tol.-
Heating Unit							
Boilerpower_input (kW)		85,0			85,0		
Temperature t max, @ inlet 12°C		83,0	0,0	3,0	83,0	0,0	3,0
Delta temp. variance at 50 °C set point, at @ gun (°C)		30,0	0,0	3,0	30,0	0,0	3,0
Boiler on time at 50 °C set point, @ inlet 12° (sec)		30,0	5,0	5,0	30,0	5,0	5,0
Steam temp. t II @ outlet and v. Steam nozzle(°C)		140,0	10,0	30,0	140,0	10,0	30,0
Pressure P2 @ outlet with standard nozzle (bar)		27,0	5,0	5,0	27,0	5,0	5,0
Fuel pump type		Diesel			Diesel		
Oil pressure (bar)		12,0	0,5	0,0	12,0	0,5	0,0
Nozzle size, oil		1,75 60°H			1,75 60°H		
CO2 content min (%)		10,5	0,5	0,0	10,5	0,5	0,0
Efficiency burner (%)		92,0	1,5	0,5	92,0	1,5	0,5
Soot picture		0-1			0-1		
Exhaust outlet temperature (°C)		175,0	10,0	10,0	175,0	10,0	10,0
Exhaust temperature, cut off (°C)		270,0	0,0	12,0	270,0	0,0	12,0
Fuel consump. @ dT=45 deg(kg/h)		4,6			4,6		
Fuel consumption (kg/h)		7,3			7,3		
Water volume in coil (l)		4,8			4,8		
Fuel tank (l)		17,0			17,0		
Others							
Gun		ST ERGO 2000			ST ERGO 2000		
Lance		TORNADO PLUS			TORNADO PLUS		
Hose		DN 8x20m 3/8"			DN 8x20m 3/8"		
High Pressure Nozzle		NT 0550			NT 0550		
Noise level 1m Lpa(dBA)		78,2	1,5	1,5	78,2	1,5	1,5
Noisepower LWA (dB) A		96,0	1,5	1,5	96,0	1,5	1,5
Impact force	N	54,0			53,0		
Vibration ISO 5349 (m/s²)		≤ 2,5			≤ 2,5		
Protection Class		IP X5			IP X5		
Max detergent flow from full internal tank (%)		4,0	1,0	1,0	4,0	1,0	1,0
Max detergent flow from full internal tank (L/min)		0,6	0,2	0,2	0,6	0,2	0,2

NEPTUNE 5 FA							
Description		5-61FAX NO 400V/230/3 ~ 50Hz 25/16A			5-61FA Expt 440/220V/3 ~ 60Hz 23/14A		
Item no.	Tol.	107146656			107146657		
Technical data		Test result	Tol.+	Tol.-	Test result	Tol.+	Tol.-
Pump-Data							
Max. inlet pressure (bar)		10,0			10,0		
Max. Inlet temperature (°C)		40,0			40,0		
Pressure at pump head	0	195	11	11	190	10	10
Pressure @ Cylinder Head (bar)	0	200	11	11	195	11	11
Pressure @ Outlet (bar)	0	197	11	11	193	11	11
Pressure @ Gun (bar)	0	170	9	9	165	9	9
Pressure cut off @ Cylinder Head (bar)		220	5	5	215	5	5
Pressure Pmax safety valve @ Cylinder Head (bar)		250,0	5,0	5,0	250,0	5,0	5,0
Flow. Qiec (l/min)	2,5%	15,8	0,4	0,4	15,8	0,4	0,4
Flow. Qmax (l/min)	5%	16,9	0,8	0,8	16,9	0,8	0,8
Flow. Qmin, steam (l/min)	3%	9,3	0,3	0,3	9,2	0,3	0,3
Type		NA5			NA5		
Piston type		Cermic			Cermic		
Piston diameter (mm)		20,0			20,0		
Stroke / Wobble disc angle		12,0	8,9	11,3	9,9	8,9	11,3
Pump oil type		Oil BP Energol GR-XP220			Oil BP Energol GR-XP220		
Oil volume (l)		0,8			0,8		
Electrical							
Power supply		400/230V/3~/50Hz			220V/440/3~/60Hz		
Current consump. - hot (A)		15,8 / 25	1,0	3,0	12,5 / 21,8	1,0	3,0
Current consump. - cold (A)		16 / 25	1,0	3,0	12,7 / 22	1,0	3,0
Power Consumption - hot (kW)		7,8 / 7,6	0,5	0,5	7,8 / 7	0,5	0,5
Fuse size (A)		28 / 16			24 / 16		
Cord type		H07RN-F 4G2,5x6,0			H07RN-F 4G2,5 x 6m		
Plug type		-			-		
Control		PCB 24 volt			PCB 24 volt		
Contactor		100-C23KJ10			100-C23KJ10		
Electrical diagram		106427177			106427177		
Eletrical test data							
Highvoltage (HV) test (V)		1000 Vac			1000 Vac		
HV-Resistance (MΩ)		≥ 1MΩ / 500Vdc			≥ 1MΩ / 500Vdc		
Cord-resistance (Ohm)		0,2			0,2		
Motor-Data							
Motortype		3~ Induction			3~ Induction		
Rotational speed (min-1)		1450			1450		
Insulation		Class F			Class F		
Protection Class		IP 54			IP 54		
Nominal power [kW]		6,7	3,0	3,0	6,7	3,0	3,0
Cos j		0,8			0,8		

NEPTUNE 5 FA							
Description		5-61FAX NO 400V/230/3 ~ 50Hz 25/16A			5-61FA Expt 440/220V/3 ~ 60Hz 23/14A		
Item no.	Tol.	107146656			107146657		
Technical data		Test result	Tol.+	Tol.-	Test result	Tol.+	Tol.-
Heating Unit							
Boilerpower_input (kW)		85,0			85,0		
Temperature t max, @ inlet 12°C		83,0	0,0	3,0	83,0	0,0	3,0
Delta temp. variance at 50 °C set point, at @ gun (°C)		30,0	0,0	3,0	30,0	0,0	3,0
Boiler on time at 50 °C set point, @ inlet 12° (sec)		30,0	5,0	5,0	30,0	5,0	5,0
Steam temp. t II @ outlet and v. Steam nozzle(°C)		140,0	10,0	30,0	140,0	10,0	30,0
Pressure P2 @ outlet with standard nozzle (bar)		27,0	5,0	5,0	27,0	5,0	5,0
Fuel pump type		Diesel			Diesel		
Oil pressure (bar)		12,0	0,5	0,0	12,0	0,5	0,0
Nozzle size, oil		1,75 60°H			1,75 60°H		
CO2 content min (%)		10,5	0,5	0,0	10,5	0,5	0,0
Efficiency burner (%)		92,0	1,5	0,5	92,0	1,5	0,5
Soot picture		0-1			0-1		
Exhaust outlet temperature (°C)		175,0	10,0	10,0	175,0	10,0	10,0
Exhaust temperature, cut off (°C)		270,0	0,0	12,0	270,0	0,0	12,0
Fuel consump. @ dT=45 deg(kg/h)		4,6			4,6		
Fuel consumption (kg/h) @ 12°C inlet		7,3			7,3		
Water volume in coil (l)		4,8			4,8		
Fuel tank (l)		17,0			17,0		
Others							
Gun		ST ERGO 2000			ST ERGO 2000		
Lance		TORNADO PLUS			TORNADO PLUS		
Hose		DN 8x20m 3/8"			DN 8x20m 3/8"		
High Pressure Nozzle		NT 0550			NT 0550		
Noise level 1m Lpa(dBA)		78,2	1,5	1,5	78,2	1,5	1,5
Noisepower LWA (dB) A		96,0	1,5	1,5	96,0	1,5	1,5
Impact force	N	54,0			53,0		
Vibration ISO 5349 (m/s²)		≤ 2,5			≤ 2,5		
Protection Class		IP X5			IP X5		
Max detergent flow from full internal tank (%)		4,0	1,0	1,0	4,0	1,0	1,0
Max detergent flow from full internal tank (L/min)		0,6	0,2	0,2	0,6	0,2	0,2

NEPTUNE 5 FA							
Description		5-61FAX AU 400V/3 ~50 16A			5-44FA JP 200V/3 ~50Hz 20A		
Item no.	Tol.	107146658			107146660		
Technical data		Test result	Tol.+	Tol.-	Test result	Tol.+	Tol.-
Pump-Data							
Max. inlet pressure (bar)		10,0			10,0		
Max. Inlet temperature (°C)		40,0			40,0		
Pressure at pump head	0	195	11	11	157	9	9
Pressure @ Cylinder Head (bar)	0	200	11	11	162	9	9
Pressure @ Outlet (bar)	0	197	11	11	149	8	8
Pressure @ Gun (bar)	0	170	9	9	130	7	7
Pressure cut off @ Cylinder Head (bar)		220	5	5	182	5	5
Pressure Pmax safety valve @ Cylinder Head (bar)		250,0	5,0	5,0	250,0	5,0	5,0
Flow. Qiec (l/min)	2,5%	16,3	0,4	0,4	13,5	0,3	0,3
Flow. Qmax (l/min)	5%	16,7	0,8	0,8	14,5	0,7	0,7
Flow. Qmin, steam (l/min)	3%	9,3	0,3	0,3	5,8	0,2	0,2
Type		NA5			NA5		
Piston type		Cermic			Cermic		
Piston diameter (mm)		20,0			20,0		
Stroke / Wobble disc angle		12,0	8,9	11,3	10,2		
Pump oil type		Oil BP Energol GR-XP220			Oil BP Energol GR-XP220		
Oil volume (l)		0,8			0,8		
Electrical							
Power supply		400V/3~/50Hz			200V/3~/50Hz		
Current consump. - hot (A)		15,4	1,0	3,0	18,7	1,0	3,0
Current consump. - cold (A)		16,0	1,0	3,0	18,9	1,0	3,0
Power Consumption - hot (kW)		7,6	0,5	0,5	5,4	0,5	0,5
Fuse size (A)		16,0			20,0		
Cord type		H07RN-F 4G1,5 x 6m			Power cord VCT 4x3,5x6m		
Plug type		-			-		
Control		PCB 24 volt			PCB 24 volt		
Contactor		100-C23KJ10			100-C30 24V/50-60H		
Electrical diagram		106427171			106421534		
Eletrical test data							
Highvoltage (HV) test (V)		1000 Vac			1000 Vac		
HV-Resistance (MΩ)		≥ 1MΩ / 500Vdc			≥ 1MΩ / 500Vdc		
Cord-resistance (Ohm)		0,2			0,2		
Motor-Data							
Motortype		3~ Induction			3~ Induction		
Rotational speed (min-1)		1450			1450		
Insulation		Class F			Class F		
Protection Class		IP 54			IP 54		
Nominal power [kW]		6,7	3,0	3,0	4,0	3,0	3,0
Cos j		0,7			0,8		

NEPTUNE 5 FA							
Description		5-61FAX AU 400V/3 ~50 16A			5-44FA JP 200V/3 ~50Hz 20A		
Item no.	Tol.	107146658			107146660		
Technical data		Test result	Tol.+	Tol.-	Test result	Tol.+	Tol.-
Heating Unit							
Boilerpower_input (kW)		85,0			67,0		
Temperature t max, @ inlet 12°C		80,8	0,0	3,0	77,5	0,0	3,0
Delta temp. variance at 50 °C set point, at @ gun (°C)		30,0	0,0	3,0	30,0	0,0	3,0
Boiler on time at 50 °C set point, @ inlet 12° (sec)		30,0	5,0	5,0	30,0	5,0	5,0
Steam temp. t II @ outlet and v. Steam nozzle(°C)		140,0	10,0	30,0	140,0	10,0	30,0
Pressure P2 @ outlet with standard nozzle (bar)		27,0	5,0	5,0	27,0	5,0	5,0
Fuel pump type		Diesel			Diesel		
Oil pressure (bar)		12,0	0,5	0,0	12,0	0,5	0,0
Nozzle size, oil		1,75 60°H			1,35 60°H		
CO2 content min (%)		10,5	0,5	0,0	10,5	0,5	0,0
Efficiency burner (%)		92,0	1,5	0,5	92,0	1,5	0,5
Soot picture		0-1			0-1		
Exhaust outlet temperature (°C)		175,0	10,0	10,0	160,0	10,0	10,0
Exhaust temperature, cut off (°C)		270,0	0,0	12,0	270,0	0,0	12,0
Fuel consump. @ dT=45 deg(kg/h)		4,8			3,9		
Fuel consumption (kg/h) @ 12°C inlet		7,3			5,7		
Water volume in coil (l)		4,8			4,8		
Fuel tank (l)		17,0			17,0		
Others							
Gun		ST ERGO 2000			ST ERGO 2000		
Lance		TORNADO PLUS			TORNADO PLUS		
Hose		DN 8x20m 3/8"			DN 8x20m 3/8"		
High Pressure Nozzle		DN 8x20m 3/8"			NT 0500		
Noise level 1m Lpa(dBA)		78,2	1,5	1,5	76,4	1,5	1,5
Noisepower LWA (dB) A		96,0	1,5	1,5	92,0	1,5	1,5
Impact force	N	56,0			42,0		
Vibration ISO 5349 (m/s²)		≤ 2,5			≤ 2,5		
Protection Class		IP X5			IP X5		
Max detergent flow from full internal tank (%)		4,0	1,0	1,0	4,0	1,0	1,0
Max detergent flow from full internal tank (L/min)		0,7	0,2	0,2	0,5	0,2	0,2

NEPTUNE 5 FA							
Description		5-44FA JP 200/3 ~60Hz 20A			5-50FAX USA 230V/1 ~60Hz 30A		
Item no.		107146661			107146665		
Technical data		Test result	Tol.+	Tol.-	Test result	Tol.+	Tol.-
Pump-Data							
Max. inlet pressure (bar)		10,0			10,0		
Max. Inlet temperature (°C)		40,0			40,0		
Pressure at pump head	0	157	9	9	133	7	7
Pressure @ Cylinder Head (bar)	0	162	9	9	138	8	8
Pressure @ Outlet (bar)	0	149	8	8	118	7	7
Pressure @ Gun (bar)	0	130	7	7	111	6	6
Pressure cut off		182	5	5	158	5	5
Pressure Pmax safety valve @		250,0	5,0	5,0	250,0	5,0	5,0
Flow. Qiec (l/min)	2,5%	13,4	0,3	0,3	16,6	0,4	0,4
Flow. Qmax (l/min)	5%	14,4	0,7	0,7	16,9	0,8	0,8
Flow. Qmin, steam (l/min)	3%	5,8	0,2	0,2	9,3	0,3	0,3
Type		NA5			NA5		
Piston type		Cermic			Cermic		
Piston diameter (mm)		20,0			20,0		
Stroke / Wobble disc angle		8,4			10,2		
Pump oil type		Oil BP Energol			Oil BP Energol		
Oil volume (l)		0,8			0,8		
Electrical							
Power supply		200V/3~/60Hz			230V/1~/60Hz		
Current consump. - hot (A)		16,6	1,0	3,0	28,0	1,0	3,0
Current consump. - cold (A)		17,5	1,0	3,0	26,8	1,0	3,0
Power Consumption - hot (kW)		5,1	0,5	0,5	8,0	0,5	0,5
Fuse size (A)		20,0			30,0		
Cord type		Power cord VCT 4x3,5x6m			SJOW AWG10/3X9.0		
Plug type		-			NEMA 6-30P		
Control		PCB 24 volt			PCB 24 volt		
Contactor		100-C30 24V/50-60H			100-C12KJ10 5,5kW		
Electrical diagram		106421534			106420540		
Eletrical test data							
Highvoltage (HV) test (V)		1000 Vac			1000 Vac		
HV-Resistance (MΩ)		≥ 1MΩ / 500Vdc			≥ 1MΩ / 500Vdc		
Cord-resistance (Ohm)		0,2			0,2		
Motor-Data							
Motortype		3~ Induction			1~ Induction		
Rotational speed (min-1)		1450			1450		
Insulation		Class F			Class F		
Protection Class		IP 54			IP 54		
Nominal power [kW]		4,0	3,0	3,0	5,2	3,0	3,0
Cos j		0,8			0,8		

NEPTUNE 5 FA							
Description		5-44FA JP 200/3 ~60Hz 20A			5-50FAX USA 230V/1 ~60Hz 30A		
Item no.	Tol.	107146661			107146665		
Technical data		Test result	Tol.+	Tol.-	Test result	Tol.+	Tol.-
Heating Unit							
Boilerpower_input (kW)		67,0			78,0		
Temperature t max, @ inlet 12°C		78,2	0,0	3,0	74,4	0,0	3,0
Delta temp. variance at 50 °C set point, at @ gun (°C)		30,0	0,0	3,0	30,0	0,0	3,0
Boiler on time at 50 °C set point, @ inlet 12° (sec)		30,0	5,0	5,0	30,0	5,0	5,0
Steam temp. t II @ outlet and v. Steam nozzle(°C)		140,0	10,0	30,0	140,0	10,0	30,0
Pressure P2 @ outlet with standard nozzle (bar)		27,0	5,0	5,0	27,0	5,0	5,0
Fuel pump type		Diesel			Diesel		
Oil pressure (bar)		12,0	0,5	0,0	10,0	0,5	0,0
Nozzle size, oil		1,35 60°H			1,75 60°H		
CO2 content min (%)		10,5	0,5	0,0	10,5	0,5	0,0
Efficiency burner (%)		92,0	1,5	0,5	92,5	1,5	0,5
Soot picture		0-1			0-1		
Exhaust outlet temperature (°C)		160,0	10,0	10,0	175,0	10,0	10,0
Exhaust temperature, cut off (°C)		270,0	0,0	12,0	270,0	0,0	12,0
Fuel consump. @ dT=45 deg(kg/h)		3,9			4,8		
Fuel consumption (kg/h) @ 12°C inlet		5,7			6,7		
Water volume in coil (l)		4,8			4,8		
Fuel tank (l)		17,0			17,0		
Others							
Gun		ST ERGO 2000			ST ERGO 2000		
Lance		TORNADO PLUS			TORNADO PLUS		
Hose		DN 8x20m 3/8"			DN 8x20m 3/8"		
High Pressure Nozzle		NT 0500			NT 0750		
Noise level 1m Lpa(dBA)		76,4	1,5	1,5	80,0	1,5	1,5
Noisepower LWA (dB) A		92,0	1,5	1,5	94,0	1,5	1,5
Impact force	N	41,0			47,0		
Vibration ISO 5349 (m/s²)		≤ 2,5			≤ 2,5		
Protection Class		IP X5			IP X5		
Max detergent flow from full internal tank (%)		4,0	1,0	1,0	4,0	1,0	1,0
Max detergent flow from full internal tank (L/min)		0,5	0,2	0,2	0,7	0,2	0,2

NEPTUNE 5 FA							
Description		5-61FA EU 400V/3 ~50 16A			5-61FAX EU 400V/3 ~50 16A		
Item no.	Tol.	107146670			107146671		
Technical data		Test result	Tol.+	Tol.-	Test result	Tol.+	Tol.-
Pump-Data							
Max. inlet pressure (bar)		10,0			10,0		
Max. Inlet temperature (°C)		40,0			40,0		
Pressure at pump head	0	190	10	10	195	11	11
Pressure @ Cylinder Head (bar)	0	195	11	11	200	11	11
Pressure @ Outlet (bar)	0	193	11	11	197	11	11
Pressure @ Gun (bar)	0	168	9	9	170	9	9
Pressure cut off @ Cylinder Head (bar)		215	5	5	220	5	5
Pressure Pmax safety valve @ Cylinder Head (bar)		250,0	5,0	5,0	250,0	5,0	5,0
Flow. Qiec (l/min)	2,5%	15,8	0,4	0,4	15,8	0,4	0,4
Flow. Qmax (l/min)	5%	16,9	0,8	0,8	16,9	0,8	0,8
Flow. Qmin, steam (l/min)	3%	9,2	0,3	0,3	9,3	0,3	0,3
Type		NA5			NA5		
Piston type		Cermic			Cermic		
Piston diameter (mm)		20,0			20,0		
Stroke / Wobble disc angle		12,0			12,0		
Pump oil type		Oil BP Energol GR-XP220			Oil BP Energol GR-XP220		
Oil volume (l)		0,8			0,8		
Electrical							
Power supply		400V/3~/50Hz			400V/3~/50Hz		
Current consump. - hot (A)		15,4	1,0	3,0	15,8	1,0	3,0
Current consump. - cold (A)		16,0	1,0	3,0	16,0	1,0	3,0
Power Consumption - hot (kW)		7,6	0,5	0,5	7,8	0,5	0,5
Fuse size (A)		16,0			16,0		
Cord type		H07RN-F 4G1,5 x 6m			H07RN-F 4G1,5 x 6m		
Plug type		CEE 3P+N+G / 16A			CEE 3P+N+G / 16A		
Control		PCB 24 volt			PCB 24 volt		
Contactor		100-C16KJ10 24			100-C16KJ10 24		
Electrical diagram		106427171			106427171		
Eletrical test data							
Highvoltage (HV) test (V)		1000 Vac			1000 Vac		
HV-Resistance (MΩ)		≥ 1MΩ / 500Vdc			≥ 1MΩ / 500Vdc		
Cord-resistance (Ohm)		0,2			0,2		
Motor-Data							
Motortype		3~ Induction			3~ Induction		
Rotational speed (min-1)		1450			1450		
Insulation		Class F			Class F		
Protection Class		IP 54			IP 54		
Nominal power [kW]		6,7	3,0	3,0	6,7	3,0	3,0
Cos j		0,7			0,7		

NEPTUNE 5 FA							
Description		5-61FA EU 400V/3 ~50 16A			5-61FAX EU 400V/3 ~50 16A		
Item no.	Tol.	107146670			107146671		
Technical data		Test result	Tol.+	Tol.-	Test result	Tol.+	Tol.-
Heating Unit							
Boilerpower_input (kW)		85,0			85,0		
Temperature t max, @ inlet 12°C		83,0	0,0	3,0	83,0	0,0	3,0
Delta temp. variance at 50 °C set point, at @ gun (°C)		30,0	0,0	3,0	30,0	0,0	3,0
Boiler on time at 50 °C set point, @ inlet 12° (sec)		30,0	5,0	5,0	30,0	5,0	5,0
Steam temp. t II @ outlet and v. Steam nozzle(°C)		140,0	10,0	30,0	140,0	10,0	30,0
Pressure P2 @ outlet with standard nozzle (bar)		27,0	5,0	5,0	27,0	5,0	5,0
Fuel pump type		Diesel			Diesel		
Oil pressure (bar)		12,0	0,5	0,0	12,0	0,5	0,0
Nozzle size, oil		1,75 60°H			1,75 60°H		
CO2 content min (%)		10,5	0,5	0,0	10,5	0,5	0,0
Efficiency burner (%)		92,0	1,5	0,5	92,0	1,5	0,5
Soot picture		0-1			0-1		
Exhaust outlet temperature (°C)		175,0	10,0	10,0	175,0	10,0	10,0
Exhaust temperature, cut off (°C)		270,0	0,0	12,0	270,0	0,0	12,0
Fuel consump. @ dT=45 deg(kg/h)		4,6	0,0	0,1	4,6	0,0	0,1
Fuel consumption (kg/h) @ 12°C inlet		7,3	0,0	0,0	7,3	0,0	0,0
Water volume in coil (l)		4,8			4,8		
Fuel tank (l)		17,0			17,0		
Others							
Gun		ST ERGO 2000			ST ERGO 2000		
Lance		TORNADO PLUS			TORNADO PLUS		
Hose		DN 10x10m Quick 3/8"			DN 10x20m 3/8"		
High Pressure Nozzle							
Noise level 1m Lpa(dBA)		78,2	1,5	1,5	78,2	1,5	1,5
Noisepower LWA (dB) A		96,0	1,5	1,5	96,0	1,5	1,5
Impact force	N	53,0			54,0		
Vibration ISO 5349 (m/s²)		≤ 2,5			≤ 2,5		
Protection Class		IP X5			IP X5		
Max detergent flow from full internal tank (%)		4,0	1,0	1,0	4,0	1,0	1,0
Max detergent flow from full internal tank (L/min)		0,6	0,2	0,2	0,6	0,2	0,2

Neptune 5 FA Variants.
Single phase: 5-50 US.
Three phase: 5-44 JP, 5-50 EU, 5-61 EU, 5-61NO, 5-61 EXP, 5-61 AU, 5-FA SB.
X vs. Standard : Hose Reel and Hose lenght 15m on X models.

_ : These numbers refer to the theoretical total impact of spraying water calculated by the formula:
Impact = Q1 x √ P1 x 0.24 [N]
P1 = bar. Q1 = l/min.v P1.

The Neptune 5 FA is build with a NA5 pump.
The by-pass system is flow activated, unlike the pressure activated by-pass system known from previous Neptune machines.
The frame, cabinet, detergent tank and fuel tank is identical to previous Neptune 5 models.

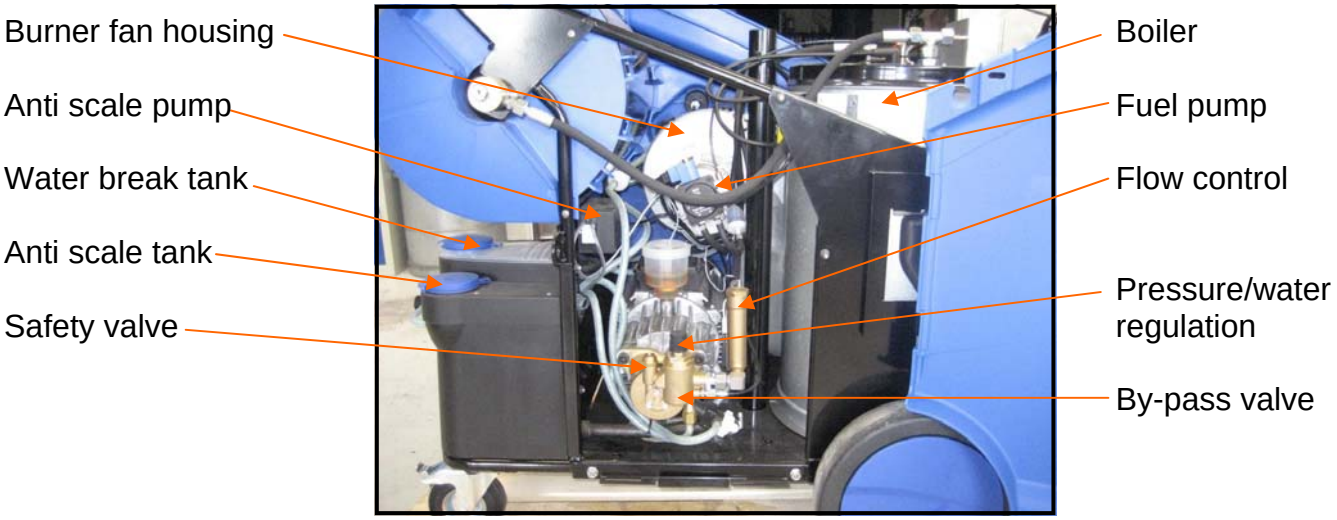


Fig.C.1: Side view

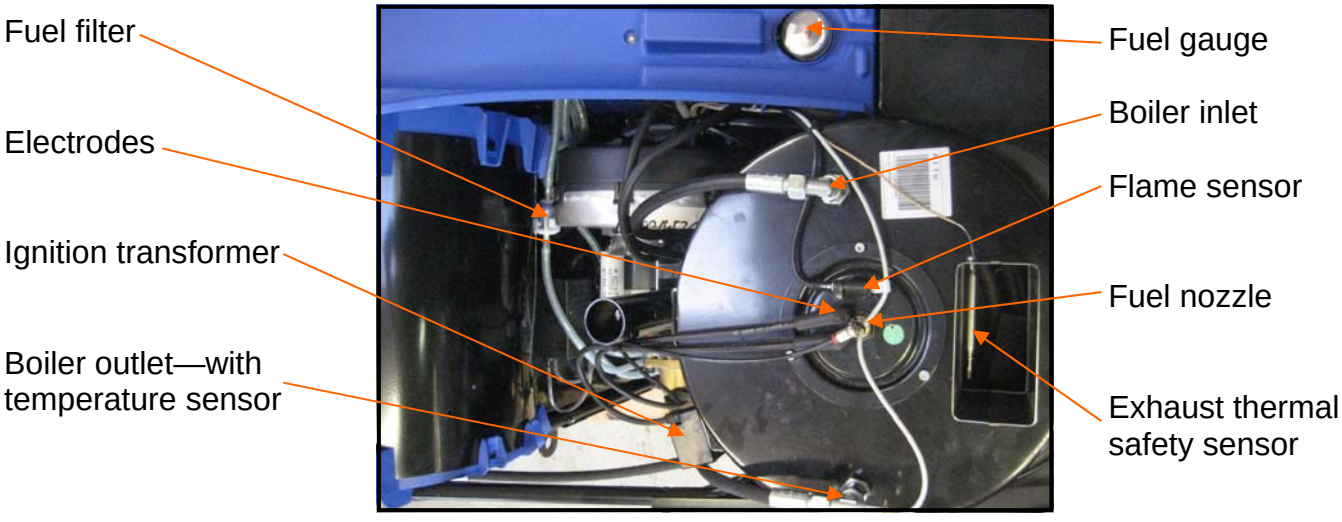


Fig.C.2: Top view

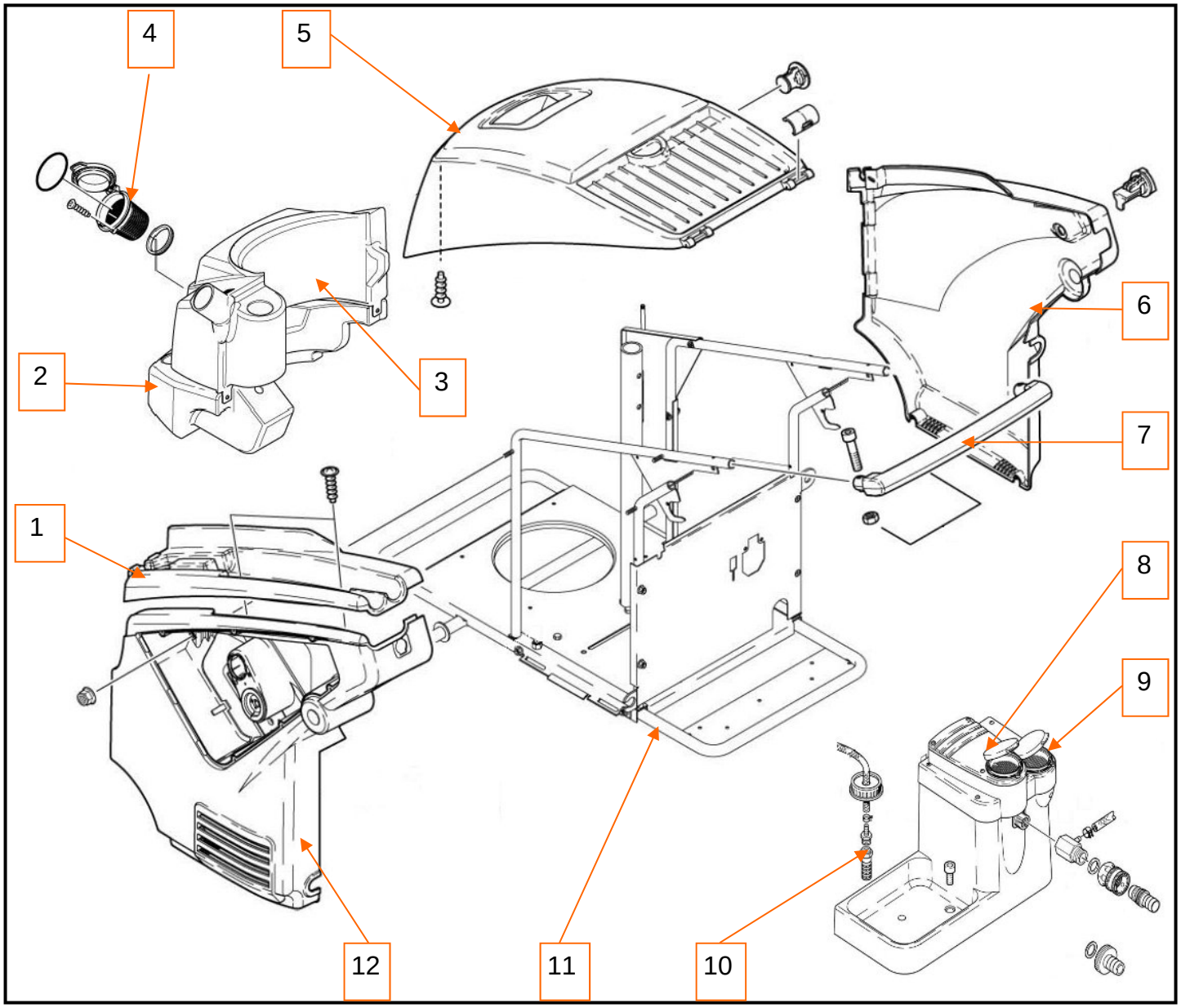


Fig.C.3: Frame & cabinet parts

1. Lance holder
2. Detergent tank
3. Fuel tank
4. Fuel filter
5. Top cover
6. Side cabinet—right
7. Handle
8. Detergent tank
9. Water break tank
10. External detergent filter
11. Frame
12. Side cabinet—left

The electric box (Fig.C.6) contains the control board, the transformer. relays, fuses,and connection terminals. The cover plate is mounted with the main switch, the display, the temperature adjustment and five status/warningLights (Fig.C.4).
The cover is sealed around the edge and around the manometer and the detergent valve.

Main switch S1:
OFF- COLD - HOT

Display:
Temperature setting
Error mesage
Running hours
Sevice interval setting

Adjustment:
Temperature settings
Service interval settings

Operation
Fuel
Anti stone
Service

Pressure Gauge

Detergent: A/B

Fig.C.4: Operation panel

Main switch S1

Display board A2

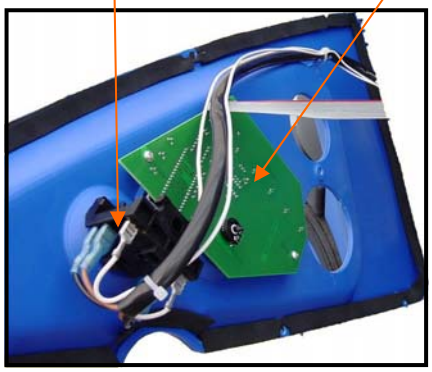
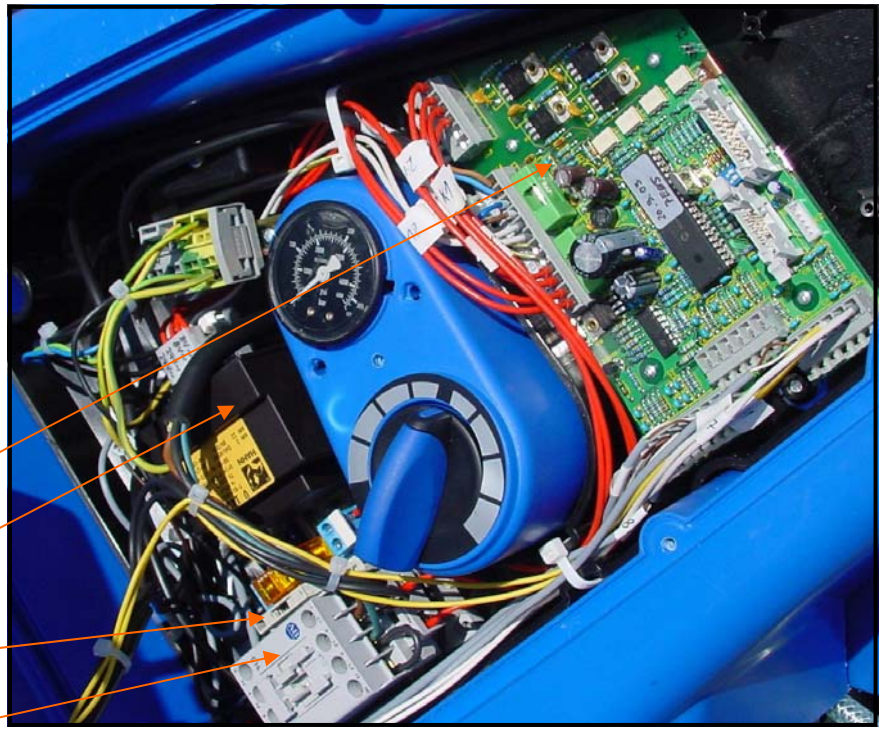


Fig.C.5: Panel - inside



Control board A1

Ignition transformer T1

Fuse F11

Contactor K1

Fig.C.6: Electrical box

The electric control system is built up around the control board A1 which is divided into two systems, a 5V DC system on one side to supply the sensors B8, B4, B6, B1,B9, B7 and on the other side it supplies the actors (contactor, relay, solenoid valve, anti stone pump) with 24V AC.
The transformer T1 supplies the system with 24V and 8V AC.
X7 is the connector to a remote control which is available as an accessory.
X2 is the connector to the Nilfisk-Alto Datalogger and to service interval settings.

Detailed function is described in chapter D.
Detailed adjustment is described in chapter G.
Electrical diagrams can be found in chapter H.

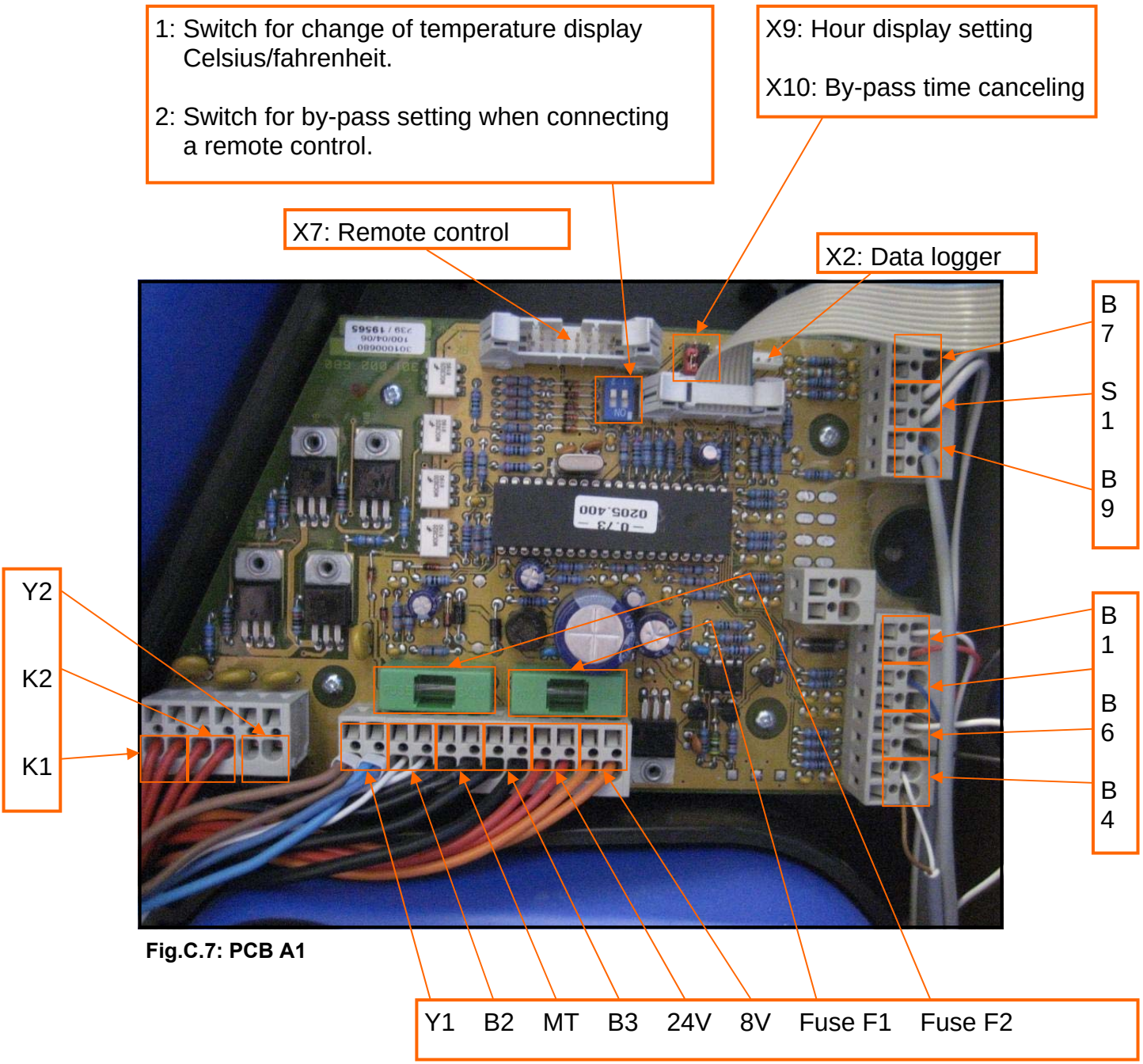


Fig.C.7: PCB A1

The boiler is the heat generating part of a hot water machine. It consists of a labyrinth-constructed tube coil, which encloses the combustion chamber. The tube coil is enclosed by a double container with boiler jacket, bottom, and top in a sandwich construction, between which the combustion air is routed into the combustion. An insulating material placed in the bottom of the boiler makes sure that the inner bottom, among other things, is protected from super heating.

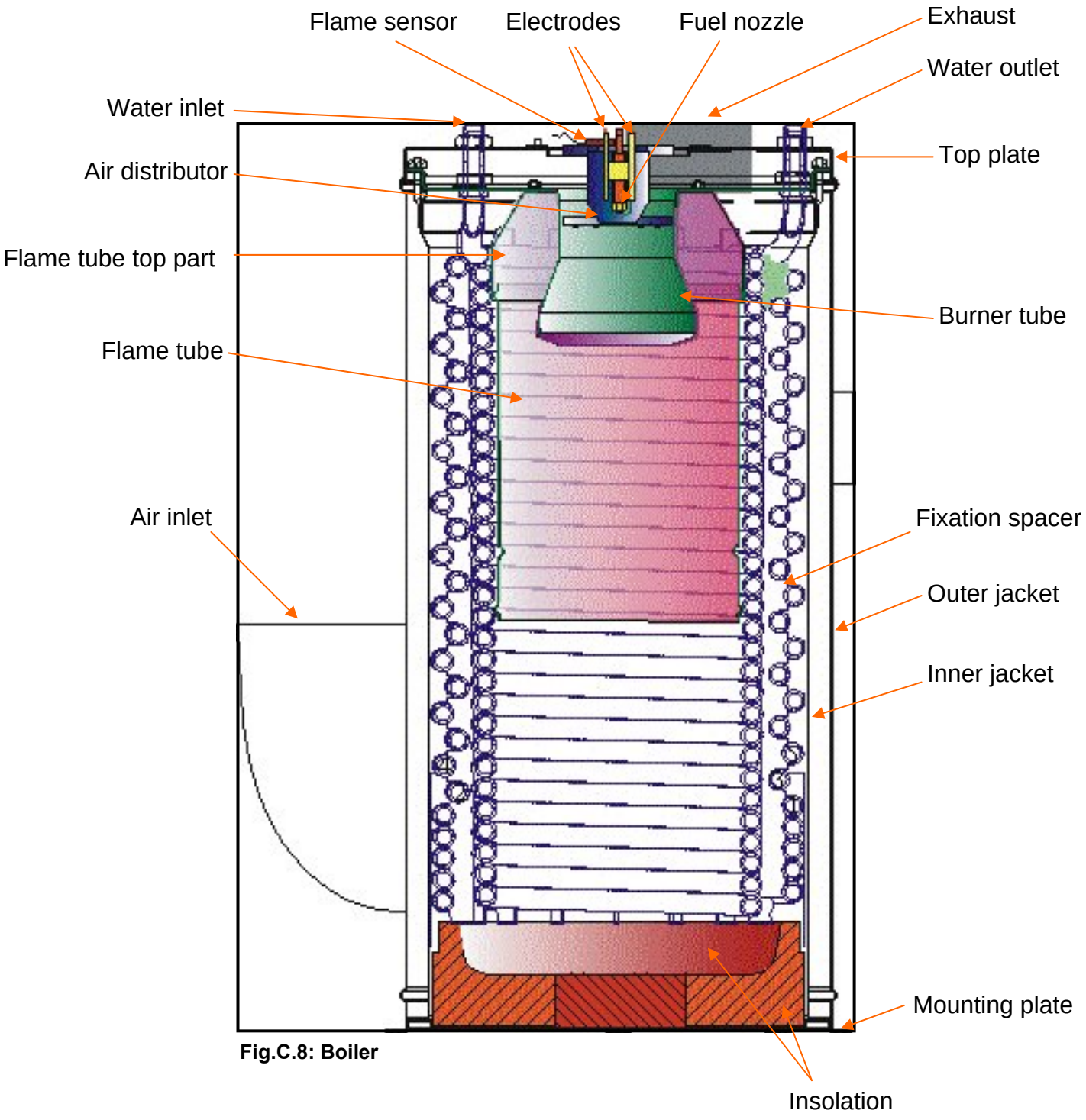


Fig.C.8: Boiler

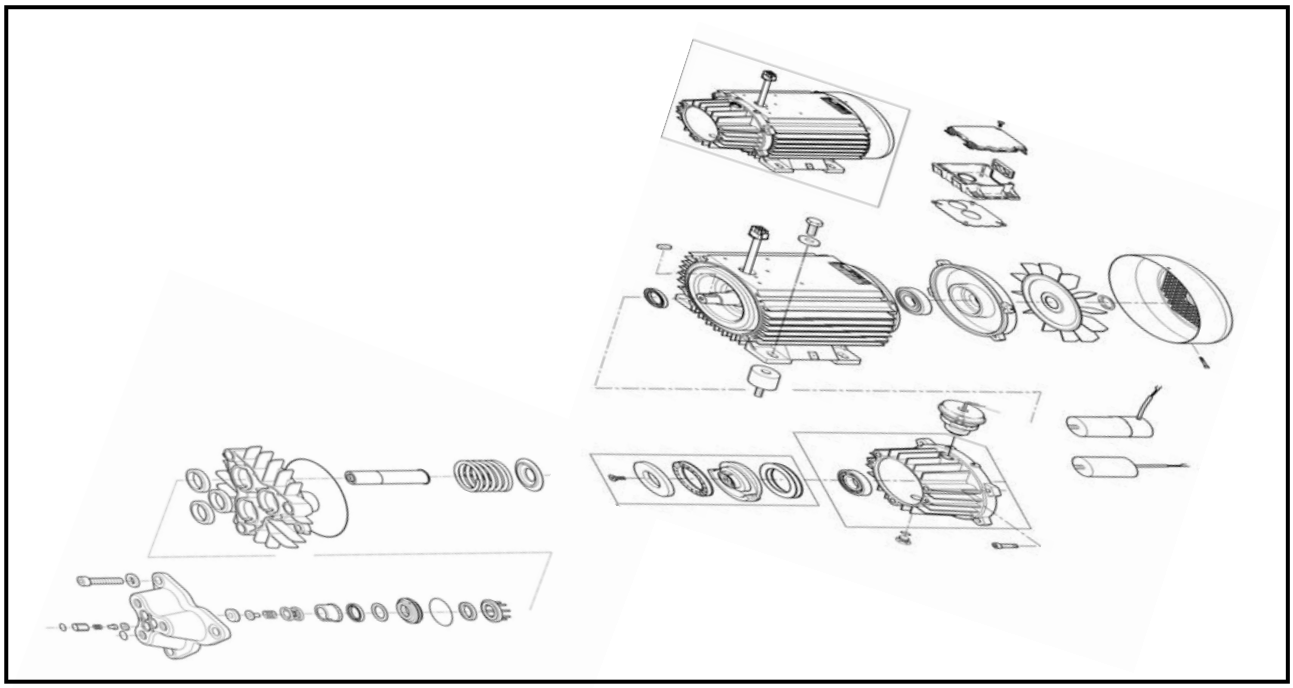


Fig.C.9: Motor - Pump unit

The NA 5 three piston axial pump used in Neptune 5 FA is build in line with the electrical motor as one compact unit.

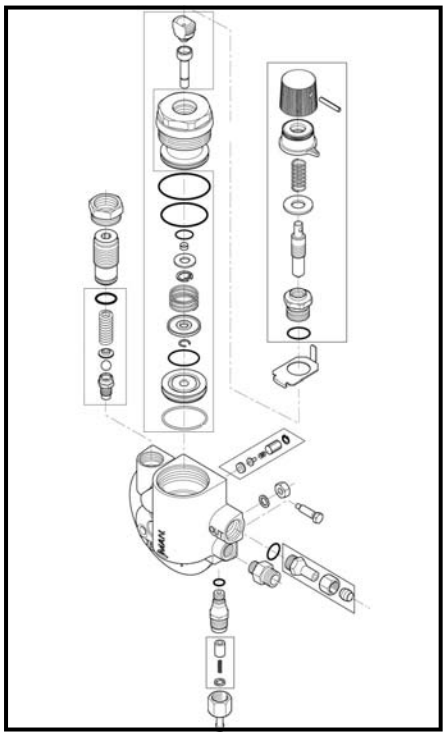


Fig.C.10: By-pass valve

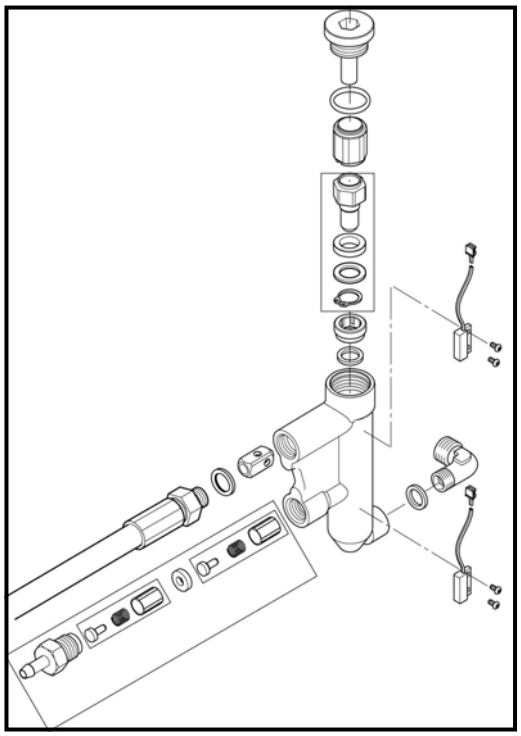


Fig.C.11: Flow control

The start/stop system in Neptune 5 FA is flow Activated.

The flow control checks if there is flow in the system, to stop and start the machine.

If the machine and the power supply are working correctly the following will happend during start up.

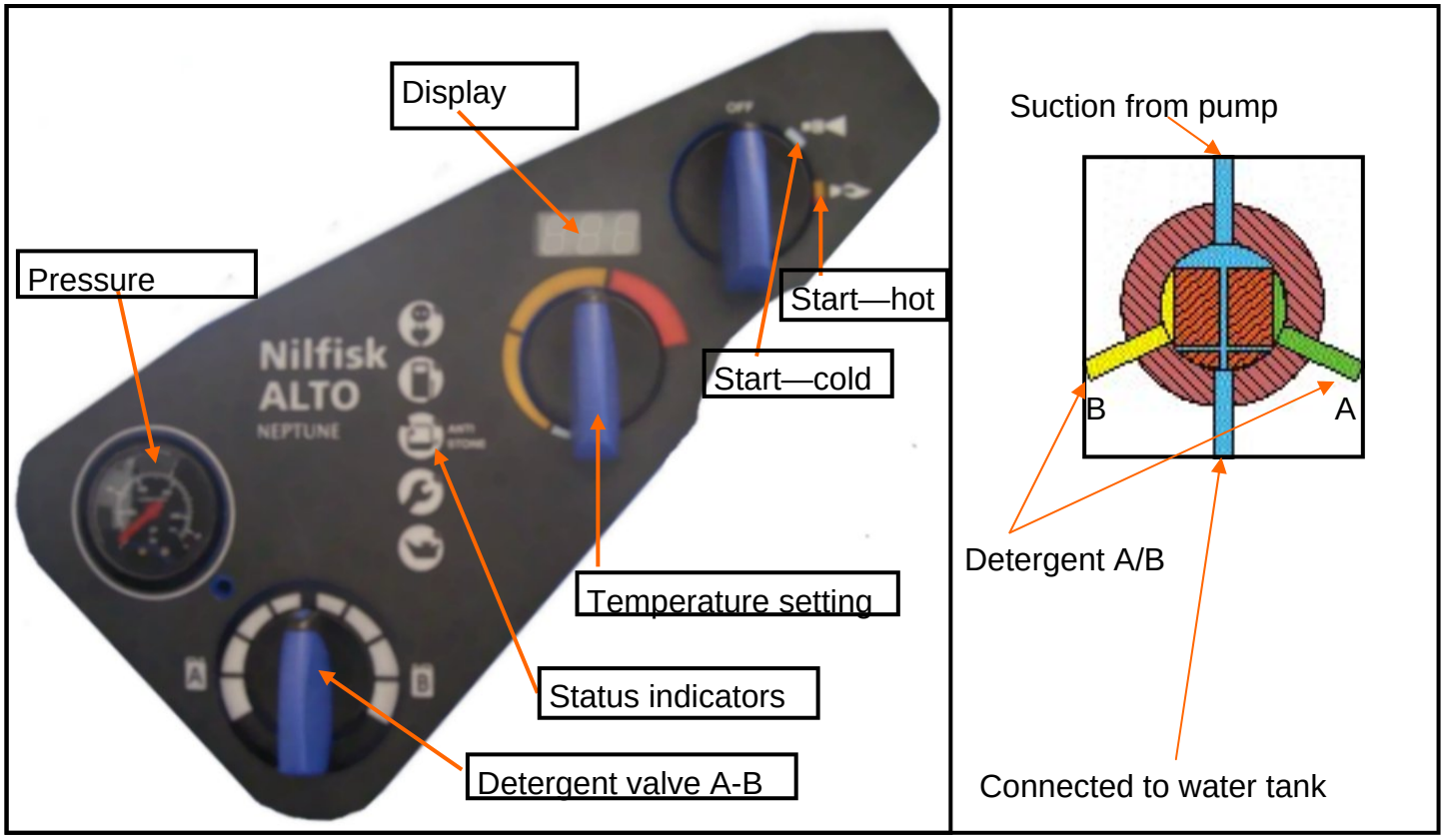


Fig.D.1: Display

Depending on the electronic set-up the following will happen.
When the start switch is turned into cold water mode the display will show the running hours the machine has been used in cold and hot mode (but it doesn't count 'standby time').
7 second later the motor will start building up pressure to cut off pressure and then by-pass.
20 second later the motor stops, the display shows the set point of the temperature in degC or degF. The indicator lights up the green light on the plug icon only. The manometer shows by-pass pressure.
Now the machine is on stand-by in cold water mode.
By switching to hot water mode the machine is then in stand-by in hot water mode.
When the spray handle is activated, flow will activate the flow switch and start the motor pump unit. At the same time anti scale pump starts up and the fan for the burner starts ventilating the combustion chamber for 3 sec. before the fuel is pumped into the boiler and the combustion takes place. The temperature will now raise until the setpoint, has been reached. The combustion will stop, but the water temperature will climb a little higher before it gets down to the setpoint. In the meantime the fan and the ignition are still working. When the combustion starts at the setpoint, the temperature will go a little lower before it starts rising.

The detergent valve makes it possible to choose between detergent A from the built in tank or detergent B from the canister. With the valve in off position as shown, it draws in water from the tank to clean the channels.

When the machine is running in hot water mode, the fan draws in air and leads it into the side of the boiler, around and between the two jackets up to the air distributor. In this way the air is preheated before it is mixed with the oil spray from the nozzle.
The cold water enters the boiler at the inner circle where the temperature is highest. By doing so, it will minimize the condensation of water on the surface of the tube.

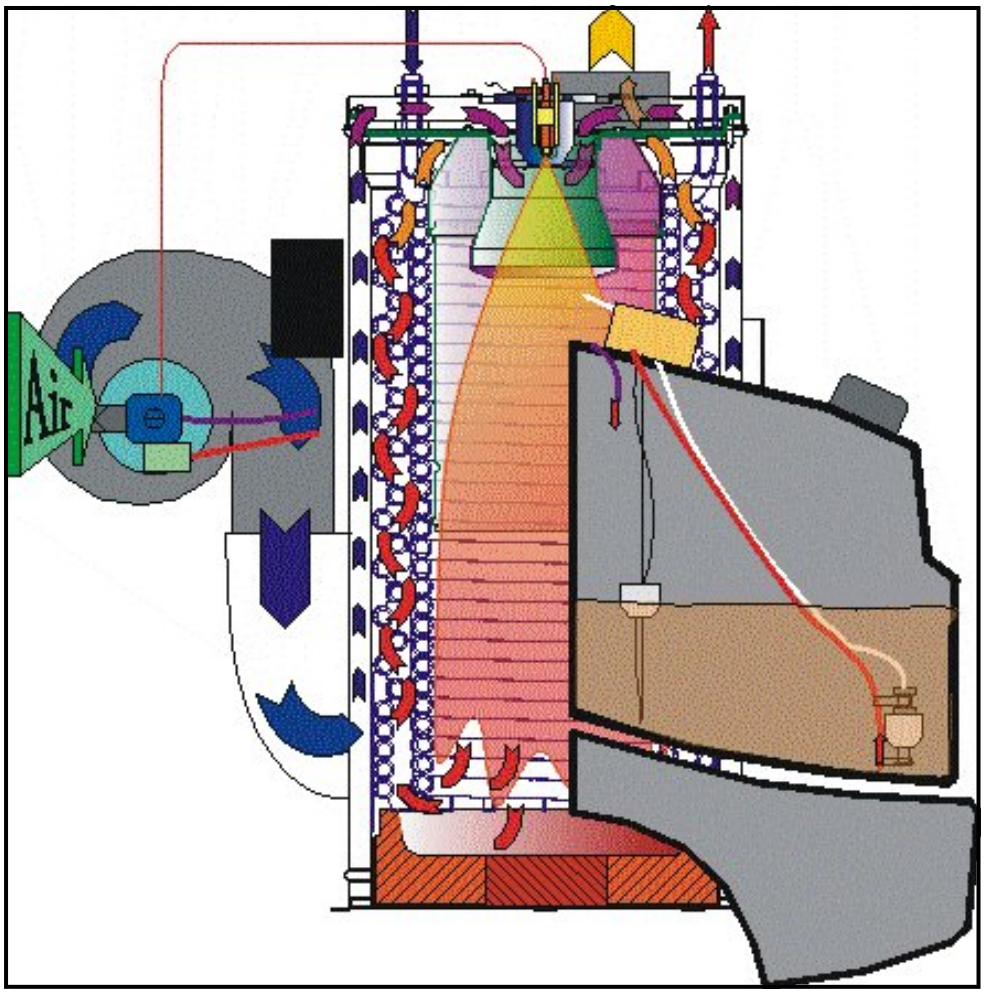


Fig.D.2: Hot water function

The fuel is drawn from the tank through the fuel filter to the pump, while in hot water mode it passes through the magnetic solenoid valve to the nozzle in the air distributor if combustion is required. Fuel is returned to the tank if combustion is not required.
The ignition transformer is active in hot water mode and it will form sparks between the electrodes. If the flame is not developed, a flame sensor placed on top of the boiler will secure that fuel pump is automatically stopped, and a fault code will be displayed on the panel.
When the machine is running normally, and the boiler is burning normally, the flame is pressed against the insulated bottom. The temperature is here approximately. 1100°C. The hot exhaust gas is pressed further round the labyrinth-shaped combustion chamber, where the heat is absorbed by the water flow in the tubes.

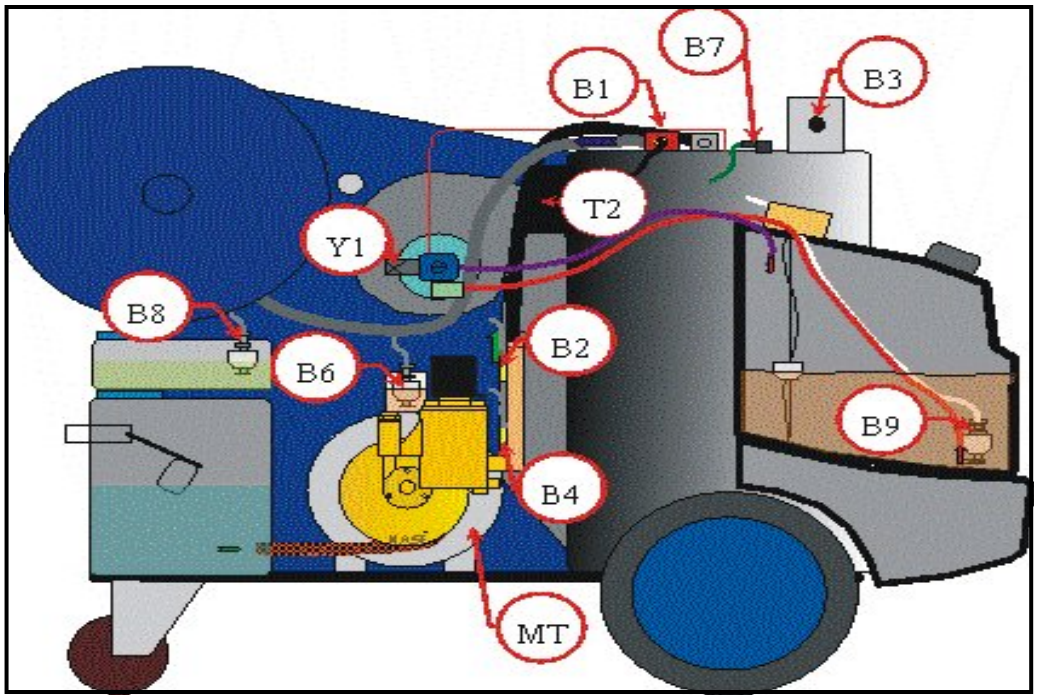


Fig.D.3: Sensors & actors

Sensors:

B1: Temperature sensor in the outlet from the boiler. Controls the combustion (Y1 on/off) according to setting.
B2: Flow switch sense the flow out of the pump into the boiler and controls solenoid Y1 on/off.
B3: Safety thermal switch placed in the exhaust of the machine, if temperature > 270 deg C 222 deg F will switch off, if the burner keeps burning without water flow through the boiler.
B4: Flow switch controls the motor start/stop. When pressure is higher than working pressure the switch will open and the motor stops.
B6: Oil level-sensor stops the machine if the pump is low on oil. Activates red light on panel.
B7: Flame-sensor detects light from the flame. If the flame is not detected when it should be there, the machine will be stopped.
B8: Level switch Anti-Stone liquid. If low, yellow light will light up.
B9: Level switch fuel (stops the fuel valve) when low on fuel and yellow light appears on the panel.
MT: Temperature switch stops the motor if the temperature in the windings is >160 deg C (320 deg F). Automatic reset.

Actors:

Y1 Solenoid opens/closes the fuel for the burner.
T2: Ignition transformer is on when burner fan is running.

The machine is supplied with main power which is transformed into 8V AC to supply the microprocessor and sensors and 24VAC to supply the actors (contactor, relay, solenoid valve).
To run the machine on hot water the following must be ok: on the front panel S1 and the temperature setting on hot and the spray handle open. If all the sensors are closed and ok K1 will start the motor and K2 the ignition and fan. Y1 will open and let in oil to the combustion chamber. If the flow stops B2 will open and the 24V supply to the solenoid Y1 will be interrupted and the combustion will stop.

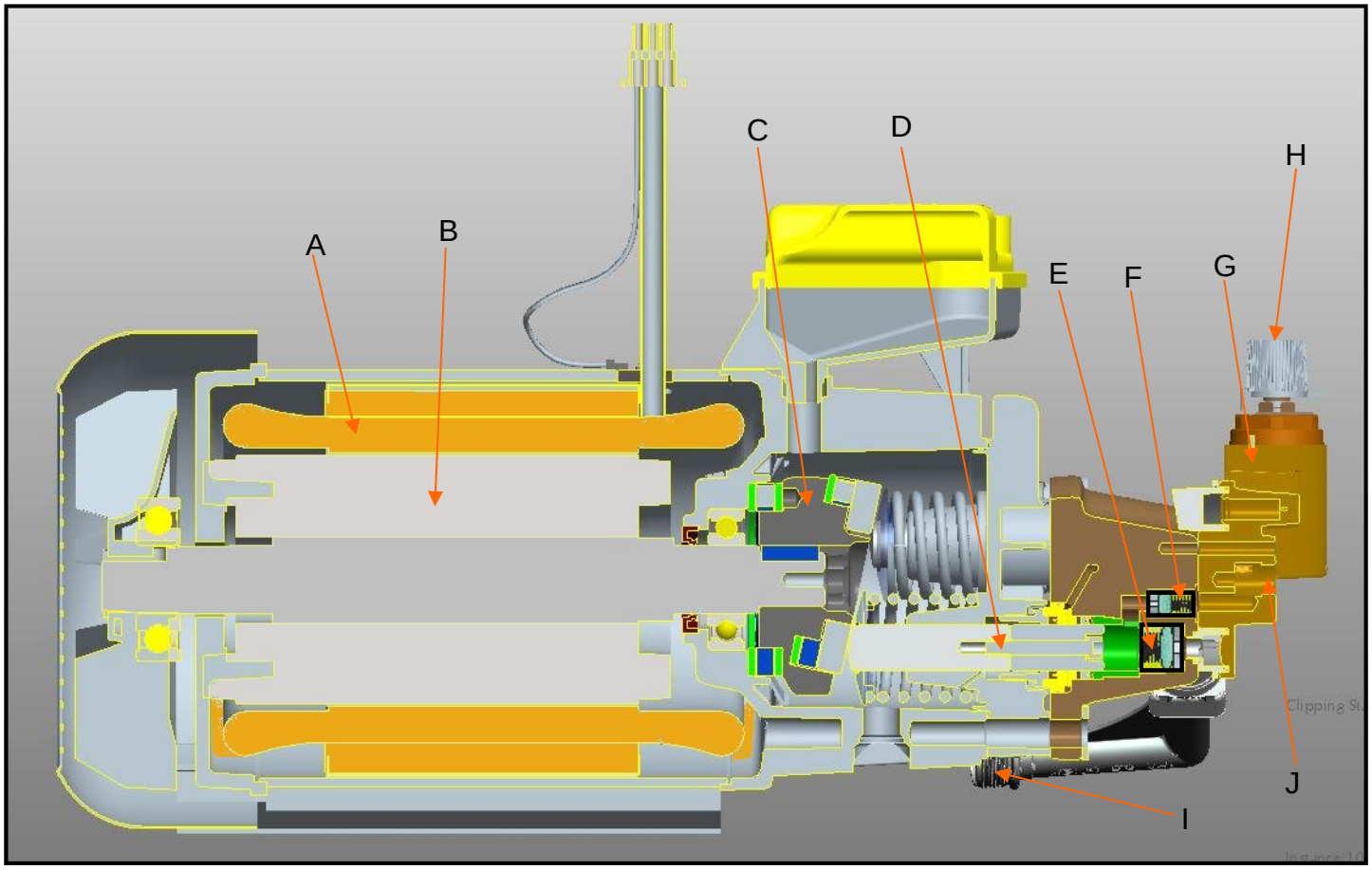


Fig.D.4: Motor/pump

A: Stator.

B: Rotor.

C: Wobble disc.

D: Ceramic piston.

E: Suction valve.

F: Pressure valve.

G: BY-pass housing

H: Water regulation valve

The three ceramic pistons ”D” are driven by a wobble disc ”C”, the mission of which is to transform the rotating power from the rotor ”B” into the reciprocating pumping pistons ”D”. The angle of the wobble disc ”C” decides the volume of water which is sucked through the suction valves ”E” and pressed out through the pressure valves ”F”.
The inlet ”I” and the outlet ”J” are connected directly to the By-pass valve ”G”.
The water volume can be adjusted by the regulation valve ”H”.

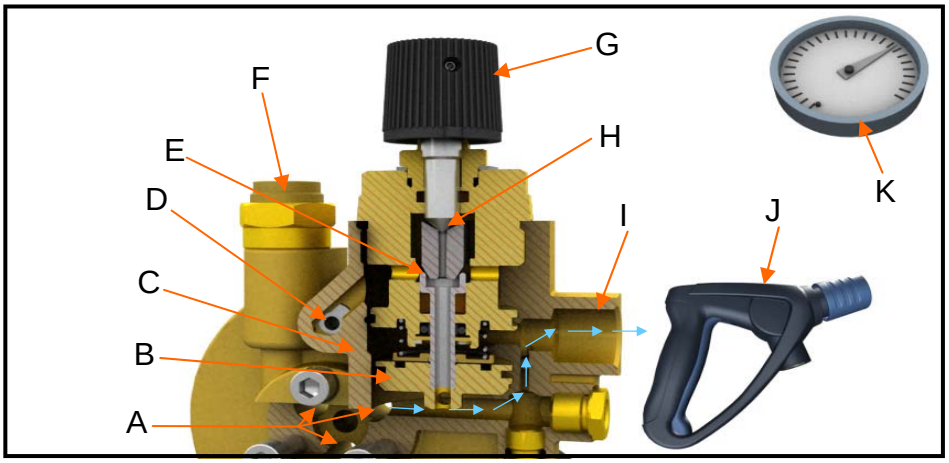


Fig.D.5: Working pressure

Machine is started and the gun ”J” with correct lance/nozzle is open -
Machine runs in working pressure ”K”:

The water is pressed from the pump outlet ”A” into the by-pass housing ”C”.
The water runs through the bottom of by-pass housing ”C” and directely to the outlet ”I”.
Due to the water pressure the by-pass piston ”B” is pressed up and the seat ”E” is closed.

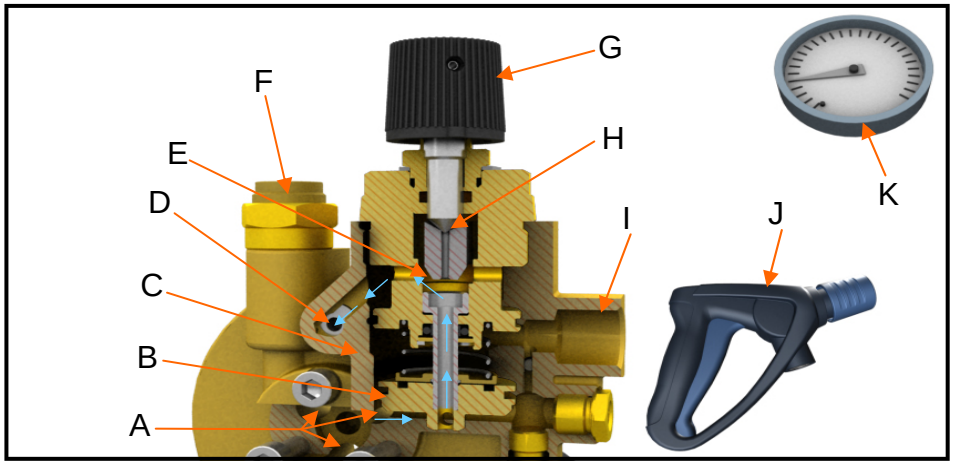


Fig.D.6: By-pass pressure

Machine is started and the gun is closed - By-pass pressure:

When the gun ”J” closes, the pressure inside the by-pass housing equalizes and the by-pass piston ”B” is pressed down by the tension of it’s spring. The seat ”E” in the top of by-pass piston opens. The water runs from the pump outlet ”A” into the by-pass housing ”C”. Due to the closed gun ”J” and the opening in the by-pass seat ”E”, the water runs back into the suction side of the pump through the valve ”D”.

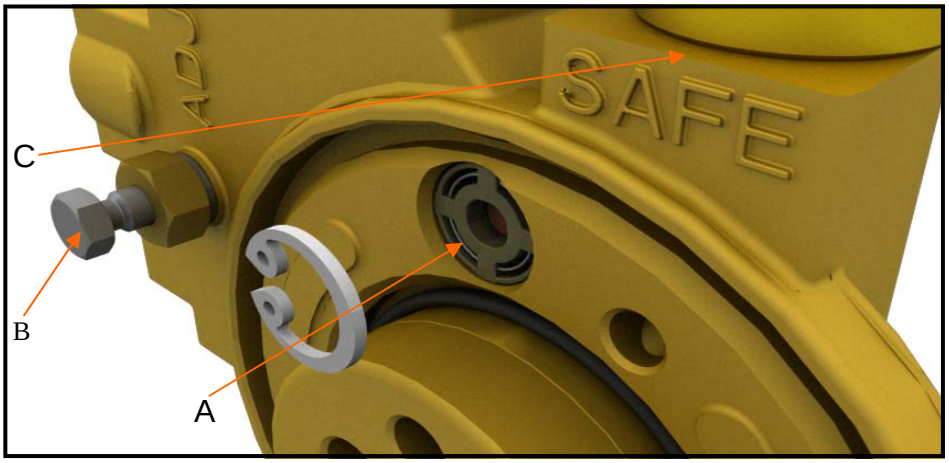


Fig.D.7: By-pass pressure

The by-pass pressure is determined of the spring tension in valve ”A”.
The tension is fixed and will bring out a by-pass pressure in about 30 - 35 bar.
Valve ”A” also secures the self suction ability.

The cut off pressure when the gun is released, is determined of the adjustment screw ”B”.
When the screw is tightened the cut off pressure will rice and by loosening it the pressure will drop.

The safety valve ”C” has no function under normal circumstances. The pressure of the safety valve is set to about 25 - 30 bar above the cut off pressure.
The safety valve will open if the by-pass valve is stocked and lead water to the suction side of the pump.

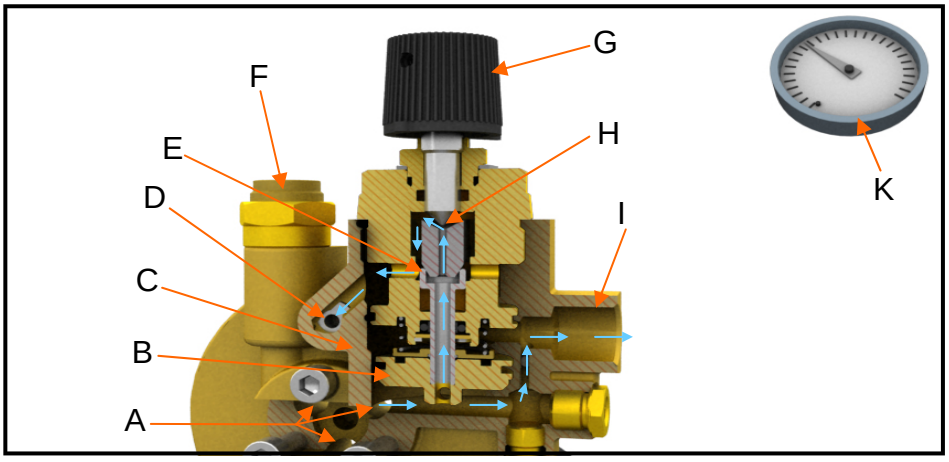


Fig.D.8: Water reduction

When the water regulation ”G” is turned counter clock wise, the seat ”H” opens and the water runs both to the outlet of the by-pass housing and in by-pass to the suction side of the pump.
The pressure ”K” will drop depending of the size of the opening in seat ”H”.

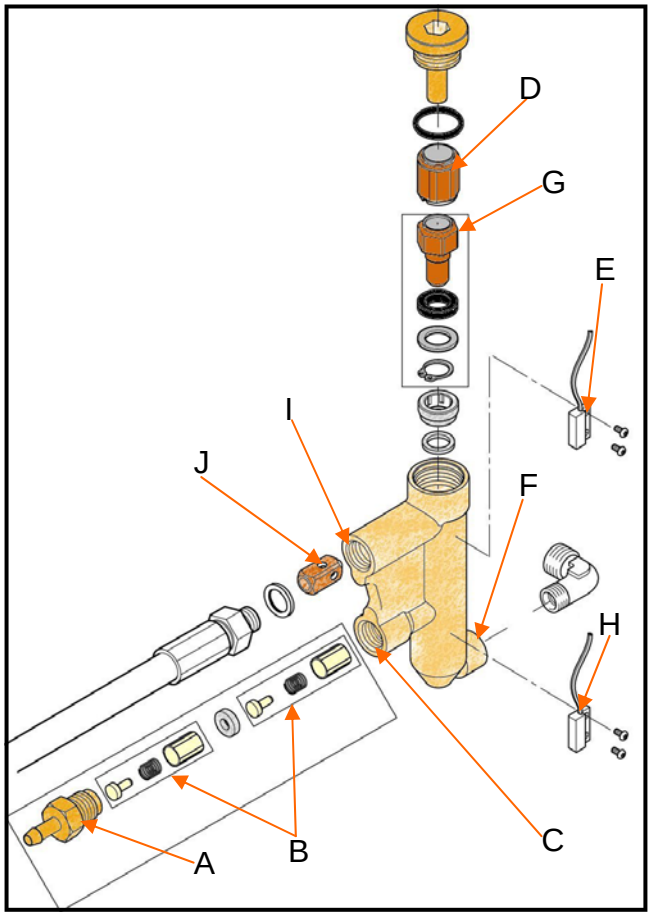


Fig.D.9: Flow control

A: Hose connection/valve seat.

B: Non return valves.

C: Inlet for water from water supply.

D: Magnet piston for reed switch E

E: Reed switch for start of motor/pump.

F: Water inlet from pump.

G: Non return valve/magnet piston for H

H: Reed switch for start of heating system.

I: Water outlet.

J: Back flow restriction.

Water supply connected to the machine:

Water from supply passes the non-return valves ”B” and lift up the piston ”D”.

Machine started in cold/hot water mode:

When piston ”D” is lifted up by the flow, the magnet in piston ”D” closes the reed contact NO ”E” which gives a signal to the PC board, which starts up the motor/pump unit. The flow from the pump lifts up piston ”G”. To secure the flow is all right, the magnet in piston ”G” closes the reed contact NC ”H” which gives the signal to the PC board. In hot water mode this signal controls the fuel solenoid valve and the anti scale pump.
The fuel solenoid valve and the anti scale pump will activate when the PC board receives the signal from reed contact ”H”.

Piston ”G”: When the gun is closed, piston ”G” closes the inlet of the flow control. Inside the piston there is a retaining valve which opens when the outlet pressure in the flow control is more than10 bar higher than the inlet pressure, when the gun is released. This pressure differens will improve the movement of piston ”G” when the gun again is activated.

When trouble-shooting it will be a great help if you can locate the fault as being either an external fault or an internal fault.
External faults are due to either improper maintenance, incorrect operation or operation under particularly straining conditions.
External faults usually represent the following:
The below-mentioned conditions have been checked and found ok:

Check point	Yes	No	Comment
1. Installation fuse blown.			
2. Plug defective.			
3. Cable bursting.			
4. Too long, to small or defective extension cables.			
5. High/low pressure nozzle blocked or worn.			
6. Spray handle defective or leaky.			
7. High pressure hose too long or defective.			
8. Water inlet filter blocked (dirty water).			
9. Inadequate supply of mains water.			
10. Air sucked into the pump (detergent tank empty).			
11. Detergent system blocked (dried-up).			
12. Inlet water too hot.			
13. Fuel filter blocked.			
14. Air adjustment faulty.			
15. Fuel level low. Water in tank.			

The internal faults require a systematic going through of the motor pump by a Nilfisk-ALTO technician. In order to establish the reason of the fault with certainty, it may be a help to use the over-leaf yes/no diagrams.

Below there is a list of the actual detectable errors with the belonging code.

The codes „SEO“, „SEC“, „LHE“ and „FLF“ only occure in Hotwater operation.

Error describtion	Code	Display
Error micro-processor	(uProcessor)	UPC
Temp-sensor closed (Short circuit)	(Sensor closed)	SEC
Temp-sensor open	(Sensor open)	SEO
Flow sensor for start open / flow-sensor for hot water closed	(Flow failure)	FLF
Flow sensor open while motor is running	(Flow problem or less water)	FLO
Leakage (detect. by micro-sw. / flow-sens.)	(Leakage)	LEA
Safety temperature switch open	(Hot safety temp-switch)	HOS
Pumpoil-switch open (LED indication)	(Pump oil error)	POL
Light indication burner with fuel disabled	(Light, fuel not activated)	LHL
No light indication burner with fuel enabled	(No light, fuel enabled)	LHE
Fuel-level switch open (LED indication)	(Fuel empty)	FUE
Thermal protector motor open	(Hot motor protector)	HOP

ERROR CODE CHECK LIST				
Display	Symptom	Outer cause	Inner cause	Check
HOS	Hot Safety temperature switch B3 opens when temp is higher than 270 deg C (518 deg F).	Wire defective.	Flow and pressure switch out of adjustment. Oil residue in boiler. Boiler clogged up.	Boiler security adjustment. Switch B3 must be changed IF open.
POL	Pump Oil Low Switch B6 open.	Wire defective.	Oil seals worn out.	B6 Switch.
LHL	Light sensor B7 see Light, when Y1 is not activated Flame sensor short circuit (Cold water operation, not possible).	Sensor not in place. Wire defective.	Oil residue in boiler is burning. Y1 Leaky. Egnition failure.	Oil pressure. Nozzle Electrode Flame sensor.
HOP	Hot Motor Protector Motor winding >160degC (320degF).	Pump pressure too high. Temp in room >40degC (104degF).	Fan on motor defective. Fuse(F1 2amp).	Sensor in windings.
FLF	Flow Failure Flow switch B2 closed and B4 open.	Wire defective	Flow piston hanging.	Reed switch.
LHE	No Light, Fuel Enabled. Light sensor B7 see no light when Y1 is open.	Wire defective. Spark failure. Oil filter blocked soot on glass.	Flow switch off.	Fuse (F11). Sensor B7.
FUE	Fuel Empty. Levelswitch B9 Open.	Wire defective.		B9 switch
LEA	Leakage. Three times start without flow.	Leaky system.	Leaky non-return valve.	B4 switch.
UPC	U-processor failure.	Water in electric system.		
SEO	Temperature Sensor Open.	Wire defective.		B1 switch
SEC	Temperature Sensor Closed.	Wire defective.		B1 switch
FLO	Flow switch B2open and flow switch B4 close.	Air in suction water. No water.		Detergent valve.

Boiler performance:

The symptom is reduced performance of the pump effect or the boiler effect. The symptom of reduced boiler effect is a lower water outlet temperature than the set value. The possible causes for this are as follows:

Scale deposits in boiler tube:
Scale formation acts as insulation and reduces heat transfer to the water. The result is raised flue gastemperature = increased flue gas loss.

Cause: The hardness of the water
Remedy: Descale boiler tube.

Sooted boiler tube:
Soot has the same effect as scale deposits, i.e. that they are both insulating against the heat transfer to the water and results in increased flue gas temperature = increased flue gas loss. Other symptoms are that the machine smokes during steady operation.

Cause 1: Air deficiency.
Remedy: Check air adjustment and fan attachment to boiler.

Cause 2: Bad oil/air mixture.
Remedy: Check oil pressure and oil quality. Replace the oil nozzle. Adjust air diffuser.

Cause 3: Unfinished combustion.
Remedy: Check bottom insulation, boiler top gasket between tube and inner boiler jacket in top cover.
Check burner tube.

Cause 4: Unstable ignition.
Remedy: Check electrodes. Adjust the air quantity (less air).

Cause 5: Leaky solenoid valve on pump Y1.
Remedy: Check/replace solenoid valve Y1.

Low oil pressure

Cause 1: Incorrect adjustment.
Remedy: Adjust pump pressure (12 bar, see page 45).

Cause 2: Filter blocked, defective pump.
Remedy: Replace filter/pump. Empty and clean tank.

Full water quantity at steam stage

Cause: Mechanical defect of by-pass valve or adjustment.
Remedy: Check by-pass valve.

Observitions

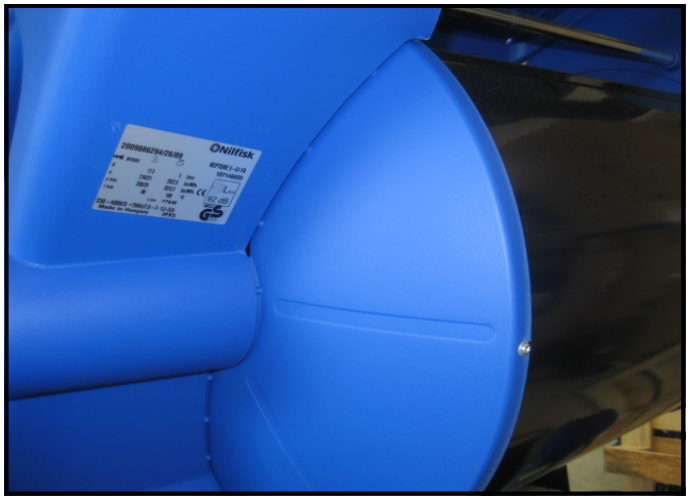


Fig.F.01: Data Plate

- Prior to any maintenance, identify the machine version at the data plate.
- The data plate is situated in two places at the machine.
- External. Back left-hand side
- Internal. Inside the Electrical Box.

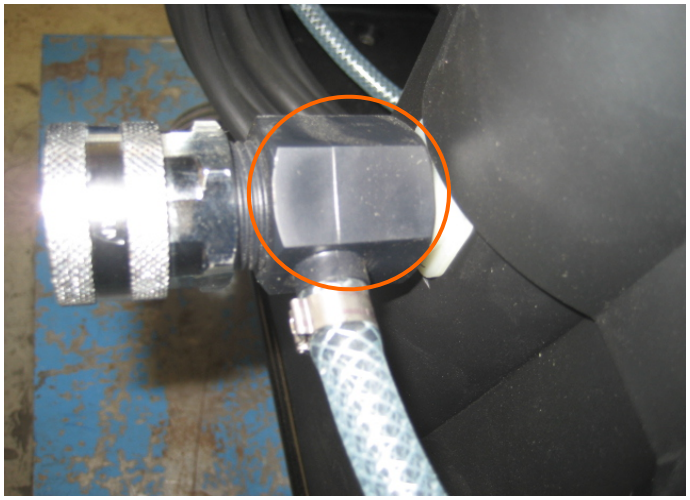


Fig.F.02: Water filter—Cleaning

- As required clean the water filter.
- Unscrew connector for water break tank.
- Pull out the filter by use of a nose pliers.
- Clean the filter and inspect for damages.
- Clean the filter.
- Replace if necessary.

Oil Maintenance

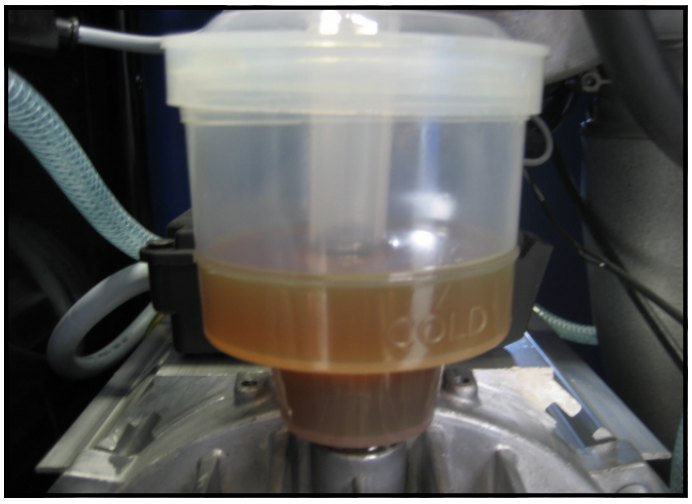


Fig.F.03: Oil extention.

- Check the pump oil quality and quantity. Refill if necessary.
- Change the oil at major repairs.
- Type of oil, refer to part ”B”.

Fuel filter.

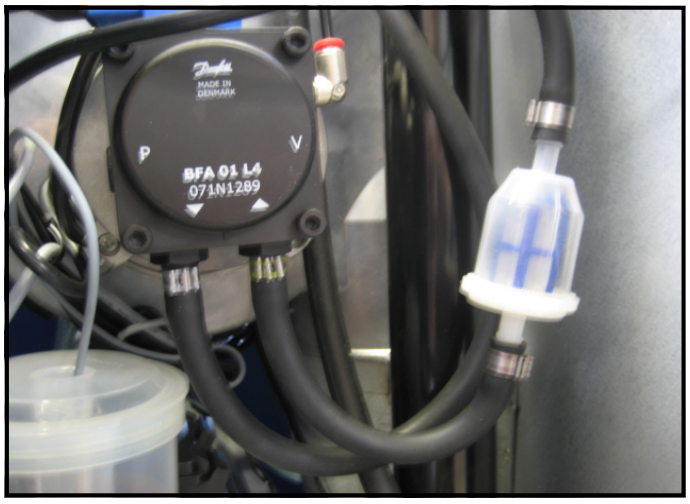


Fig.F.04: Fuel filter.

- Check the fuel filter and replace if necessary.

Electrical System - Maintenance

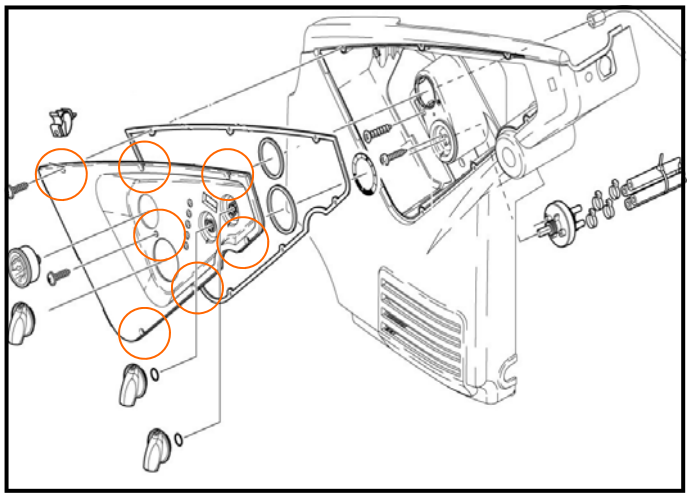


Fig.F.05: Electrical box

- **Caution !** Before any repair on the electrical system - **Pull out the power plug !**
- Remove the cover by loosing the 7 screws shown in the red circles.
- **Caution !** On 1 ~ machines capacitor might still be charged !

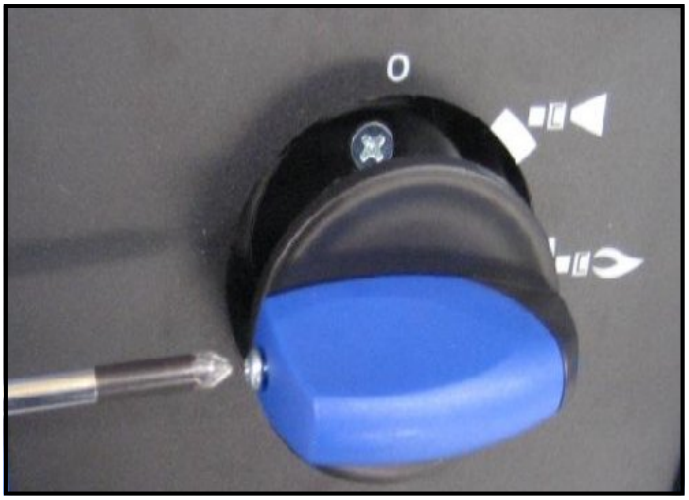


Fig.F.06: E box knob disassembly

- Loosen the screw in the bottom of the knob.
- Drag the knob out from the shaft.
-
- **Note !** When closing the electrical box, leave the wiring diagram inside.

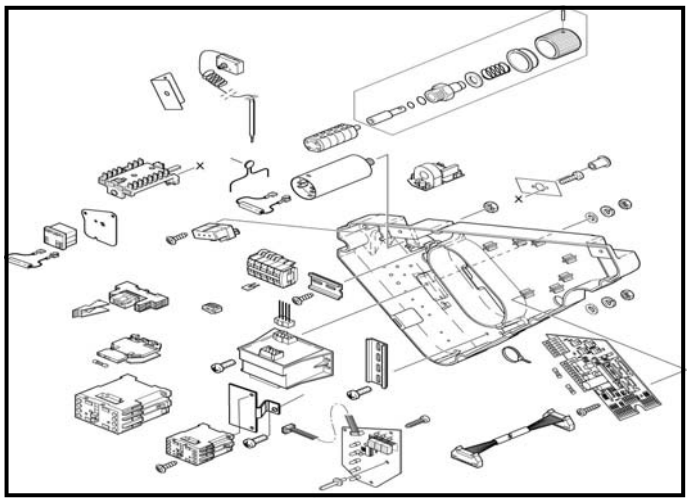


Fig.F.07: Electrical box - Exploded view.

The components in the E-box are shown by numbers
in the wiring diagrams chapter H.

Fig.F.08: Electrical box - Back side.

Before connecting devices with voltage changeover: Check that the pre-selected voltage on the machine corresponds with the voltage of the electrical installation. Otherwise the electrical devices of the machine can be destroyed.

By-pass system.

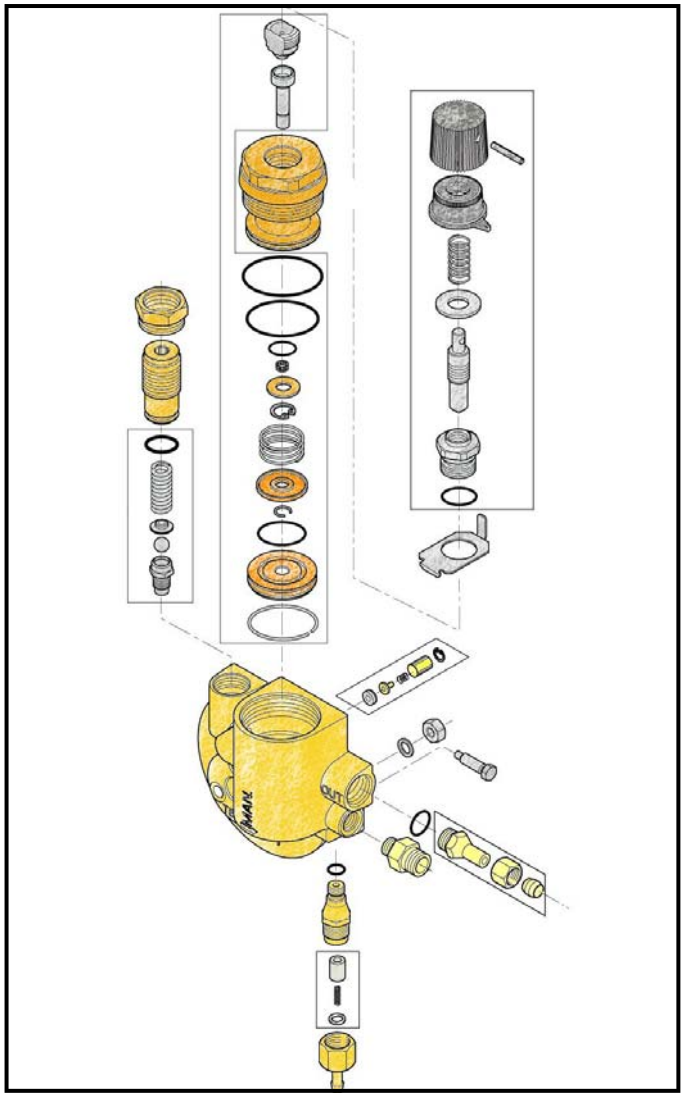


Fig.F.09: By-pass—water regulation.

By assembling and disassembling of the parts in the by-pass system be aware of the order of the components.

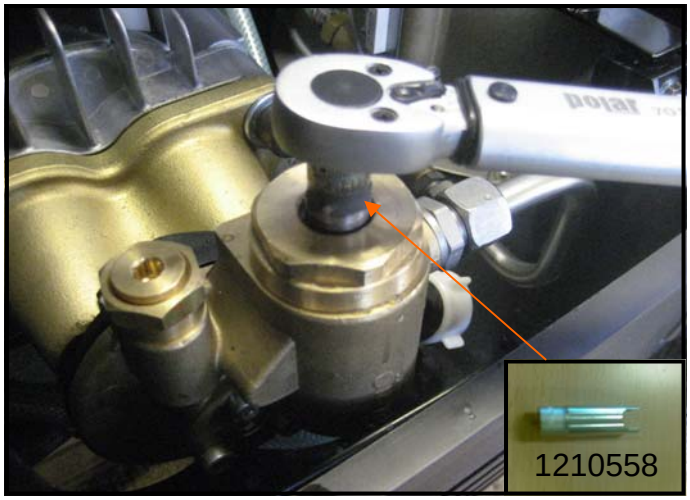


Fig.F.10: By-pass - valve cone.

By reassembling of the valve cone inside the water regulation, special tool no 1210558 can be used.

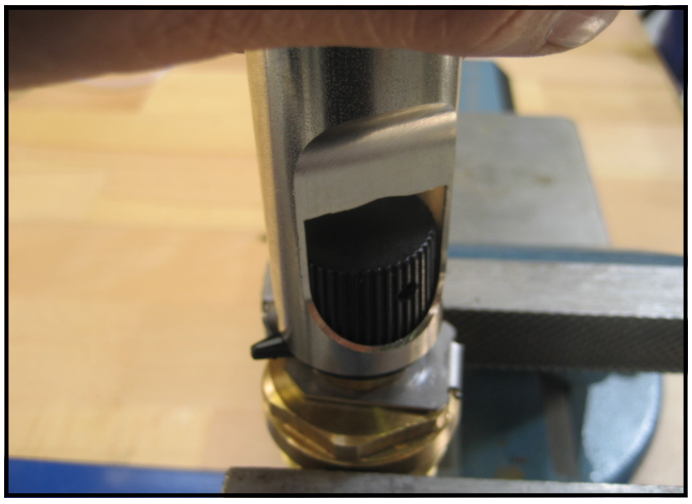


Fig.F.11: By-pass - water regulation.

By reassembling of the water regulation knob, special tool no 1211697 can be used.

Valves

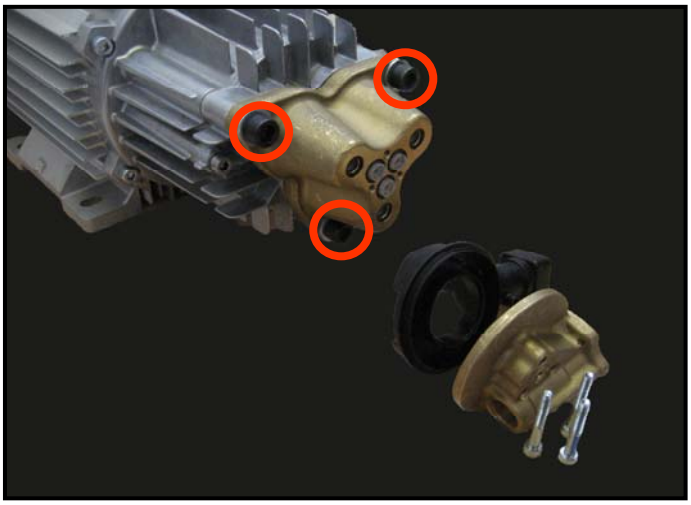


Fig.F.12: Valve housing

- Dismount the valve housing from the cylinder block by the three M12 bolts.
- Be aware of the o-rings and valve parts.

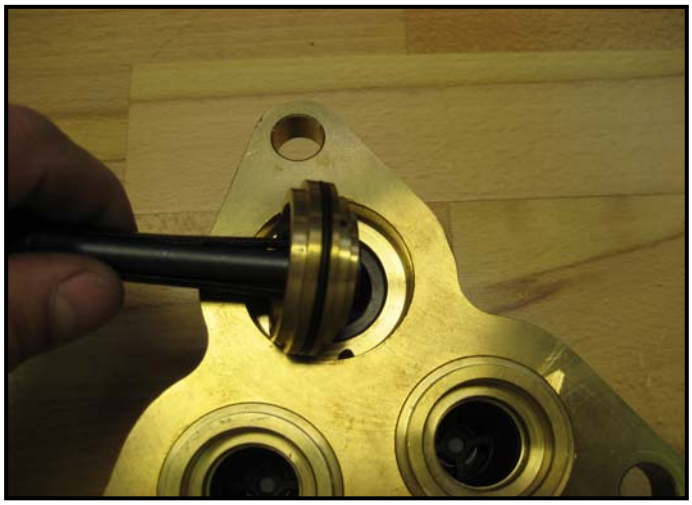


Fig.F.13: Thrust collar

- Be carefull not to damage the surface inside when dismounting the thrust collar.
- Inspect the thrust collar for damages before mounting.
- Puller used in the picture is Bahco 4521N-F.

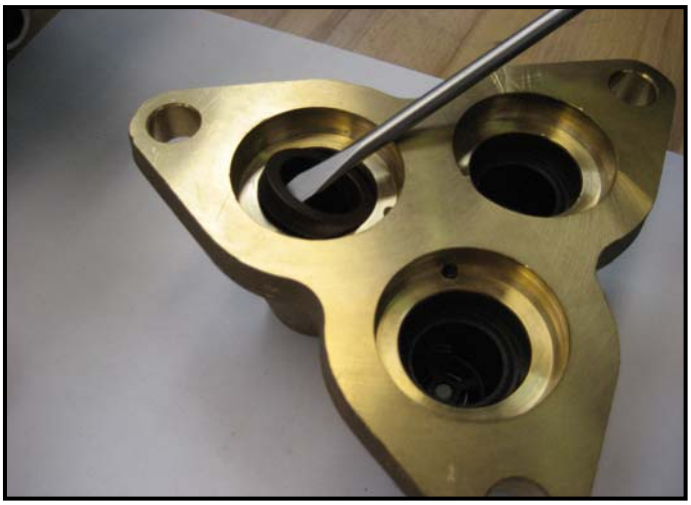


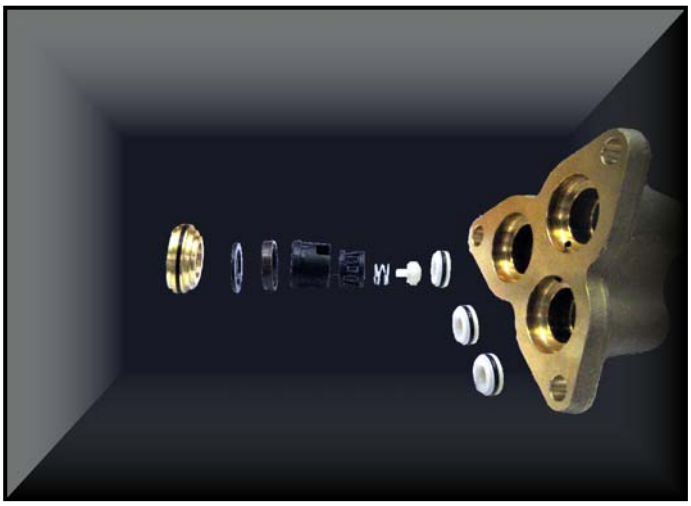
Fig.F.14: Valve housing

- Carefully tip out the sleeves with an adequate screwdriver and replace them. Be careful not to scratch the surface.

Fig.F.15: Valve housing

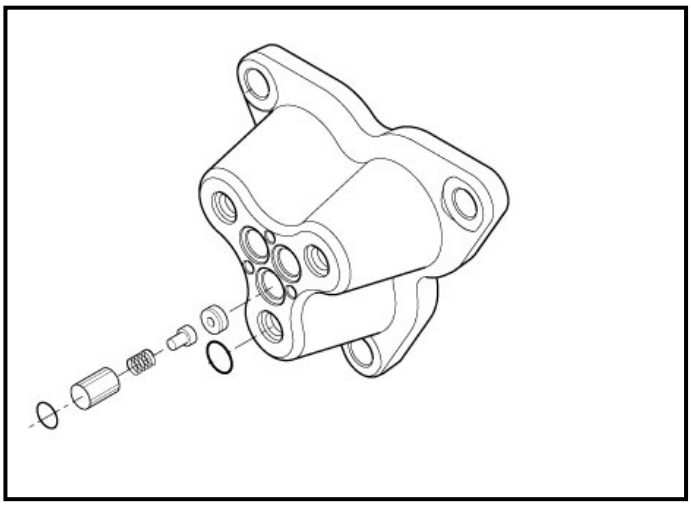
- Knock carefully on the back side of the valve seat to demount it or use an 8mm threaded pin and pull it out.
- Replace with new parts.

Valves



Pic. F.16: Suction valves

- Overview of the placement of suction valve parts.



Pic. F.17: Pressure valves

- Overview of the placement of pressure valve parts

Fig.F.18: Pressure valves

- The pressure valves can easily be taken out of the cylinder head.
- Replace with new parts if necessary.

Fig.F.19: Pressure valve seat

- Take out the pressure valve seats with an adequate puller.
- Replace with new parts if necessary.
- Puller used in the picture is Bahco 4521N-00

Cylinder block

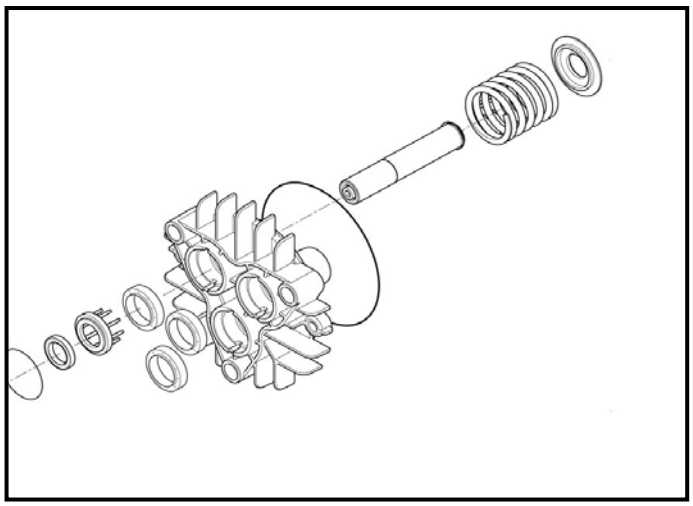


Fig.F.20: Cylinder block

- Overview of the placement of the parts in the cylinder block.

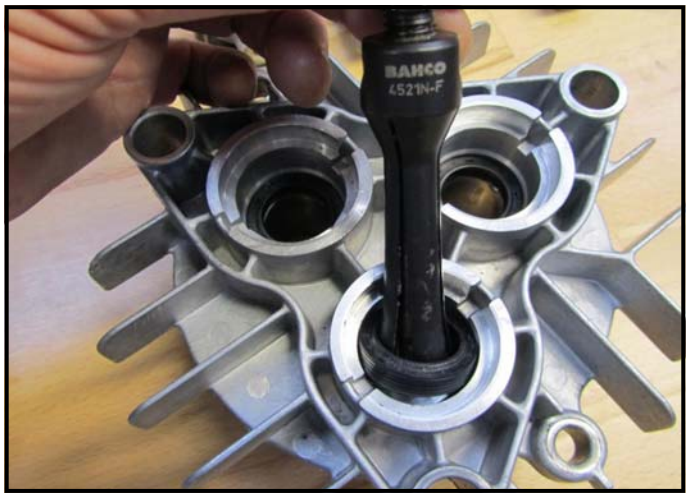


Fig.F.21: Oil Sleeves

- Take out the oil sleeves using an adequate puller.
- Be careful not to damage the surface of the cylinder block.
- Puller used in the picture is Bahco 4521N-F.

Oil seal and piston

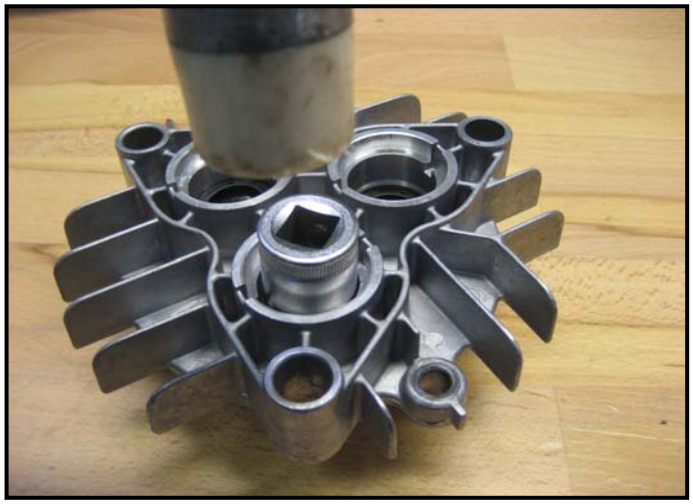


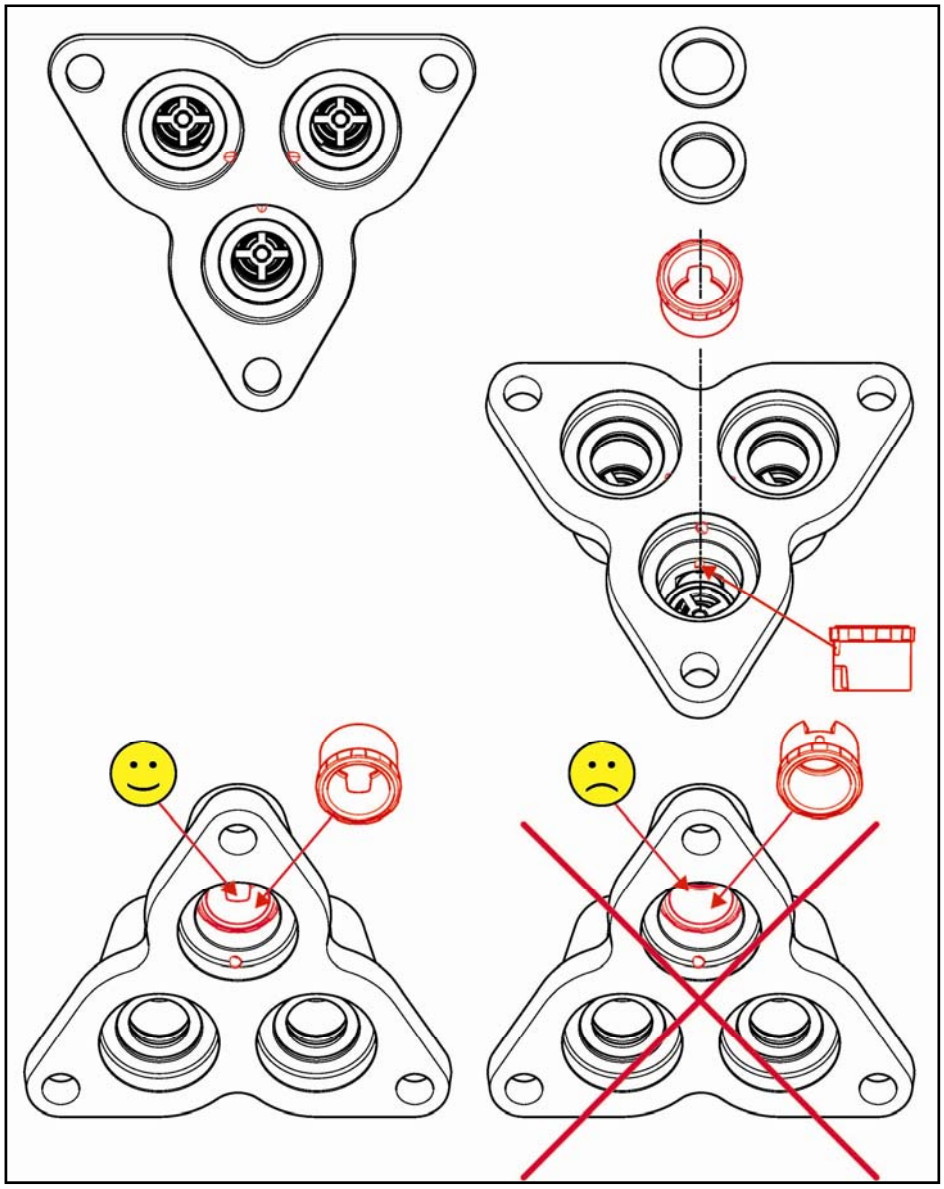
Fig.F.22: Valve Kit 3~ - Exploded View

- To make replacement easier moisten the sleeves with soapy water.
- Mount the sleeves using a 19mm box spanner and a fiber hammer.

Fig.F.23: Pistons

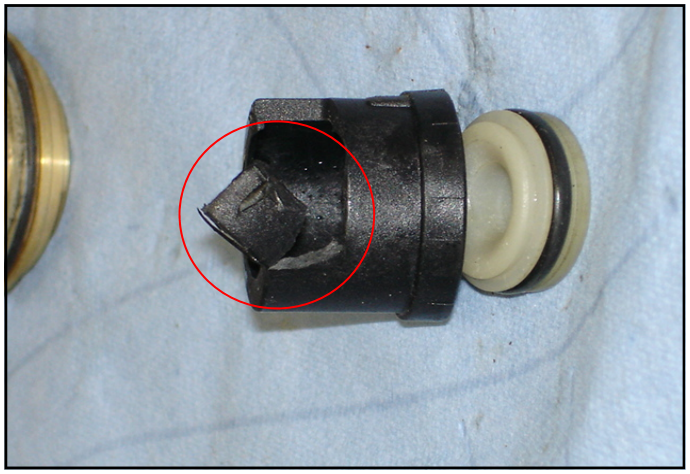
- Place sleeves, pistons and springs as shown.
- Mount the cylinder block to the D-bearing cover by the two 6mm mounting screws.

Replacement of secondary seals and header ring



Pic.9. Showing the right position of the header ring. Knob on header ring must be placed in groove against the centre of the cylinder head.

Fig.F.24: Header ring



If the header ring is mounted wrongly and not according to instruction, there is a big risk of damaging the header ring and parts of it will block pistons and valves in the pump or get stucked in the non return valve in the unloader.

Fig.F.25: Damaged header ring

Wobble disc

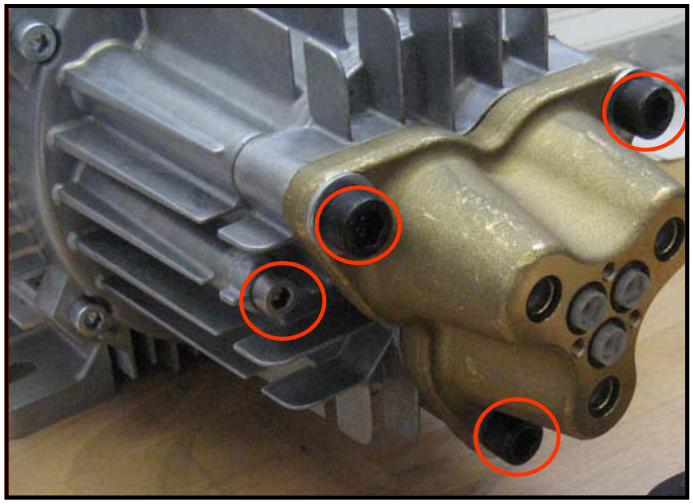


Fig.F.26: Pump head

- The cylinder head and the cylinder block is fastend to the D-bearing cover by two 6mm mounting bolts for the cylinder block and three 12mm bolts for the cylinder head.

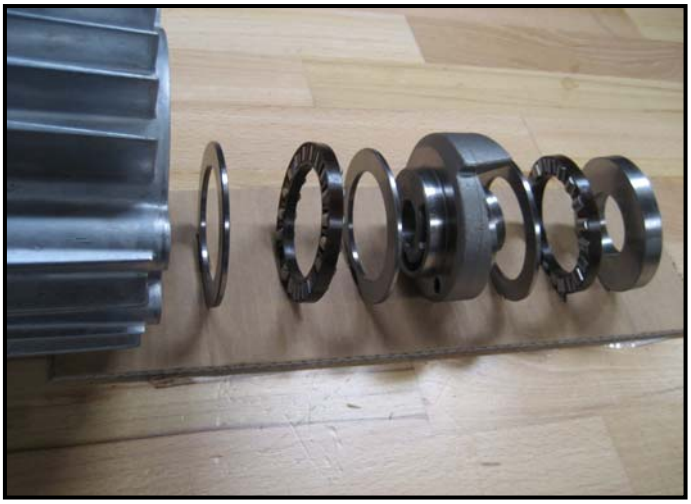


Fig.F.27: D-bearing cover and wobble disc

- Overview of the parts inside the D-bearing cover.

Fig.F.28: Wobble disc

- The center bolt is fixing the wobble disc to the motor shaft and ensure the rotor to be kept in the right position in proportion to the stator.

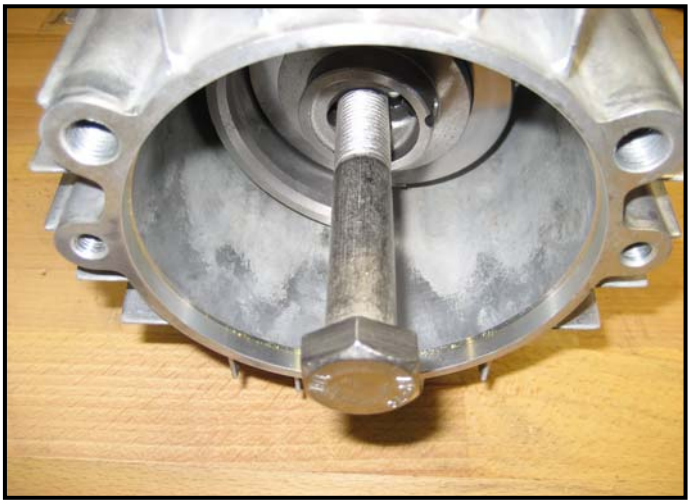


Fig.F.29: Wobble disc removal

- Demount the wobble disc screwing a
- 16mm bolt into the threads. Tighten the bolt against the motorshaft and pull the wobble disc out.

Bearing system

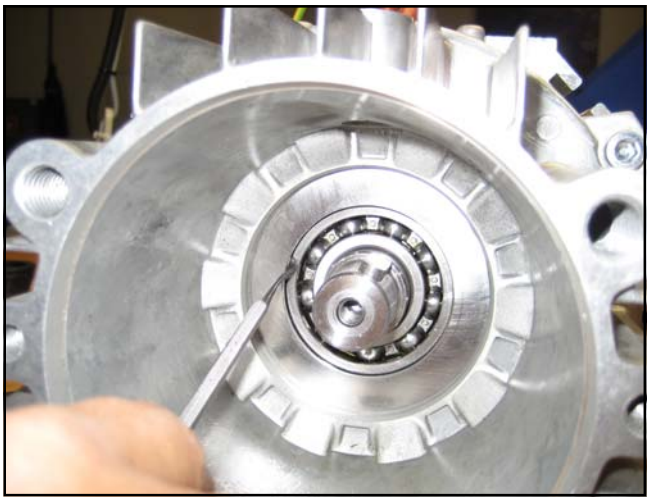


Fig.F.30: Bearing track removal

- Remove bearing track in D-bearing cover.

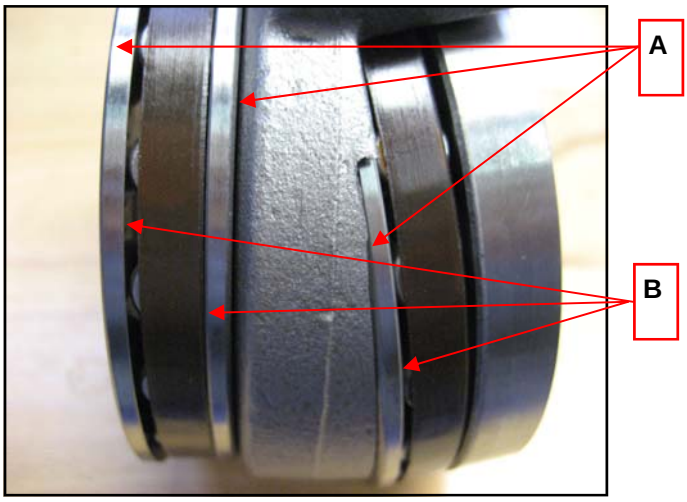


Fig.F.31: Bearing system & woble disc

- Replace the complete wobble disc system and make sure parts are as sembled according to instructions Fig.32 & Fig.33 pos. A & B

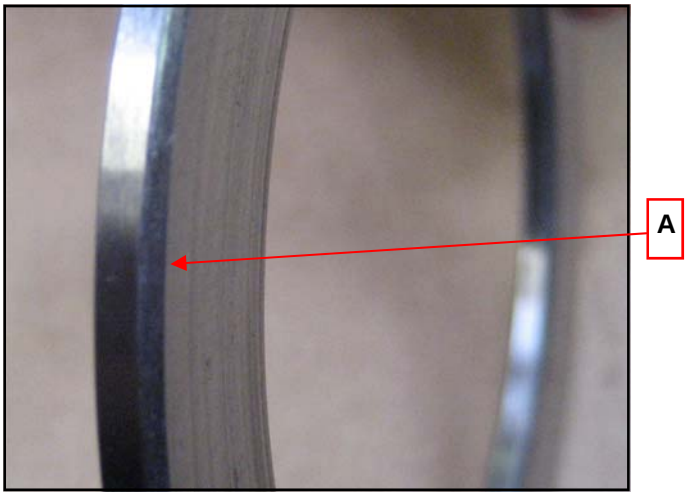


Fig.F.32: Bearing track

- The curved edge (A) of the bearing tracks must be mounted against the D-bearing cover and the wobble disc.

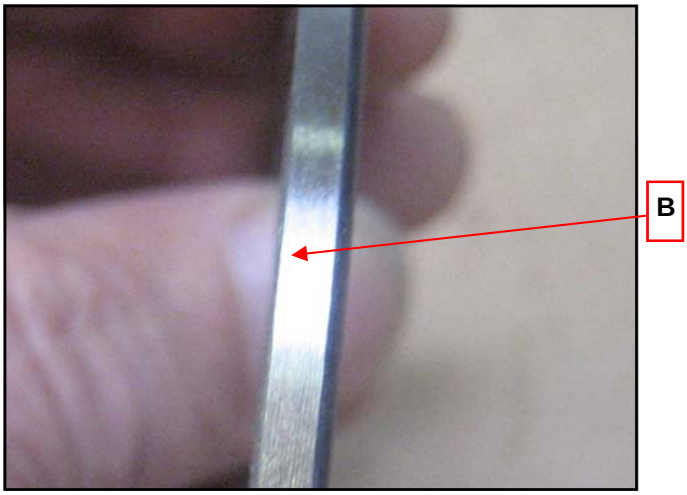


Fig.F.33: Bearing track

- The sharpe edge (B) of the bearing track must be mounted against the bearings

D-bearing cover

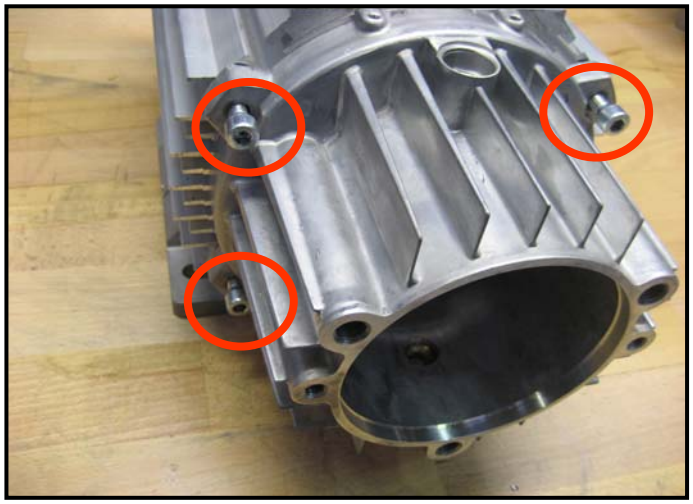


Fig.F.34: D-bearing cover

- The D-bearing cover is mounted to the Motor by four 6mm bolts.
- When the bearing is damaged, always replace the complete D-bearing cover.

Fig.F.35: Oil sleeve

- The oil sleeve in the D-bearing cover can be demounted carefully using a screwdriver.
- Mount the oil sleeve by using an adequate box spanner and a fiber hammer.

Electrical motor

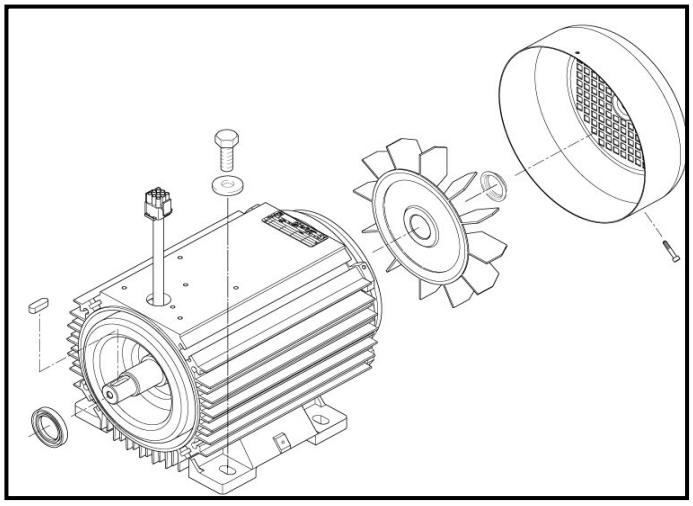


Fig.F.36: Electrical Motor

- Overview of the motor parts.

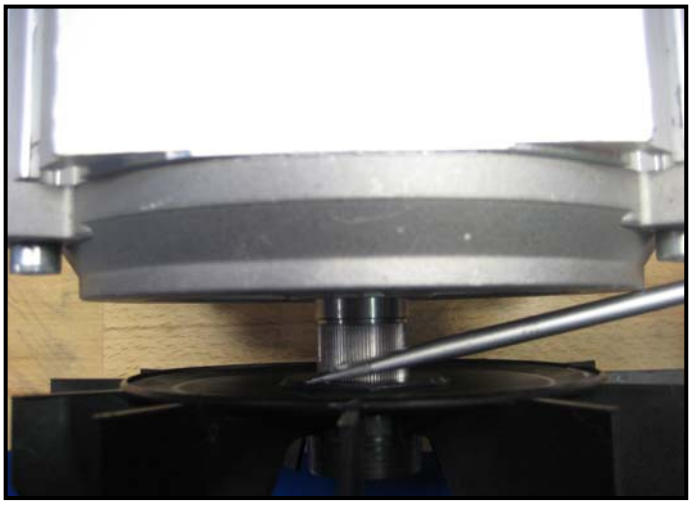


Fig.F.37: fan

- The fan can be demounted by taking off the lock ring and carefully push the fan with a screwdriver.

Fuel tank.

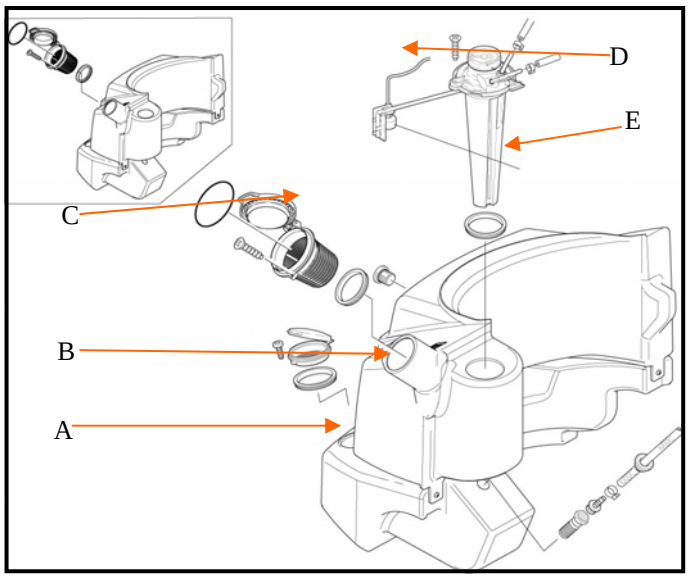


Fig.F.38: Fuel tank - Overview.

1. Detergent tank.
2. Fuel tank.
3. Strainer.
4. Float valve
5. gasket.

Heating system.

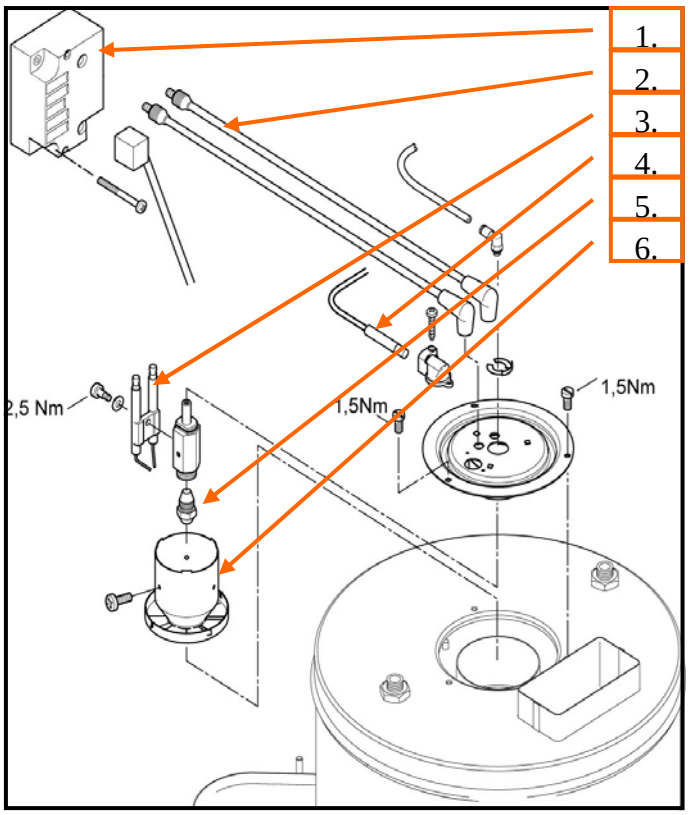


Fig.F.39: Heating system - Overview.

1. Ignition Transformer.
2. Ignition cords.
3. Ignition electrodes
4. Flame sensor.
5. Fuel nozzle.
6. Air distributer.

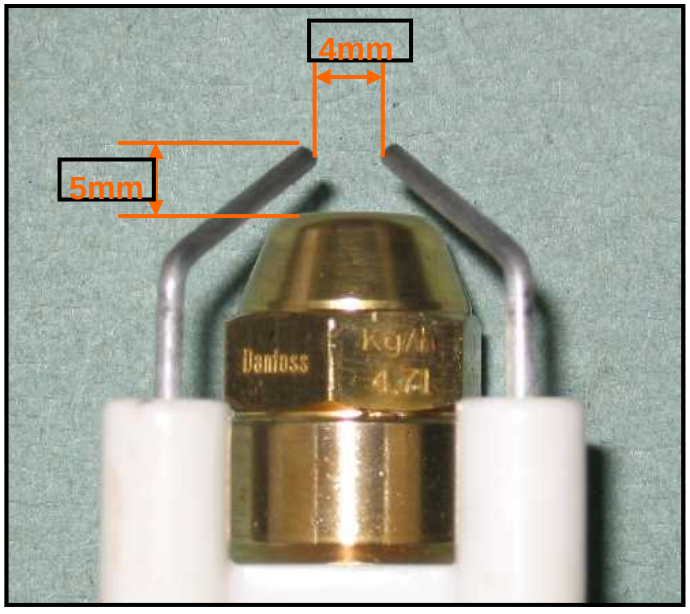


Fig.F.40: Fuel nozzle.

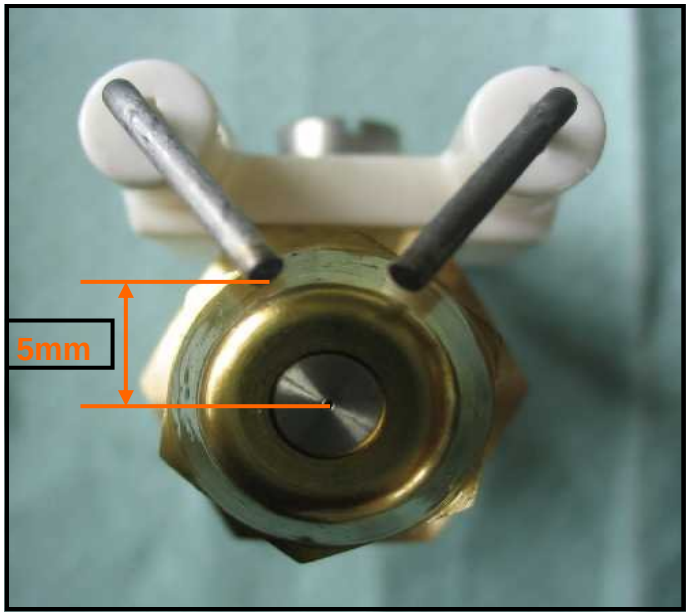


Fig.F.41: Fuel nozzle.

Exhaust temperature sensor.

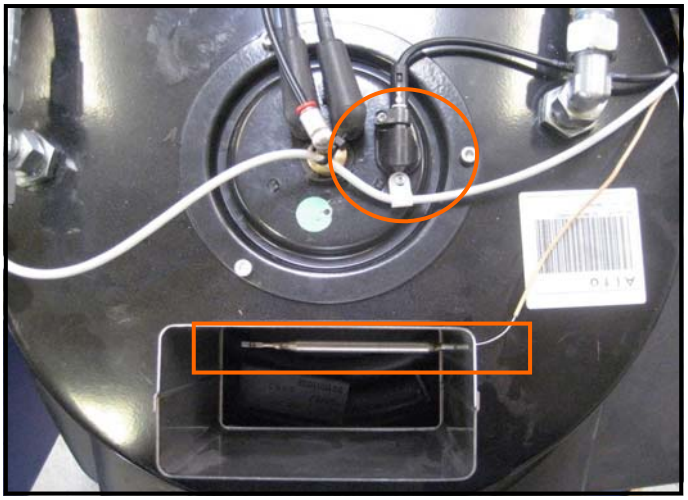


Fig.F.42: Temperatur sensor.

- The exhaust temperature sensor is fitted with 2 screws in the exhaust.

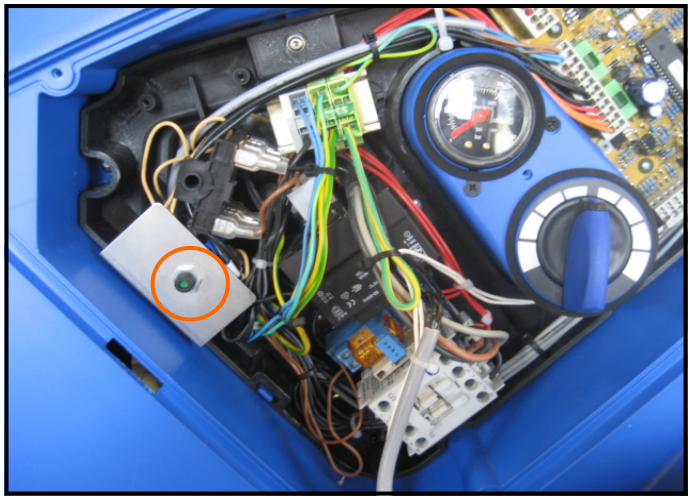


Fig.F.43: Temperatur relay.

If the exhaust temperature reaches 270°C (518°F) the machine cuts out. The relay placed in the E-box can be reset by pressing the green button.

Burner Unit.

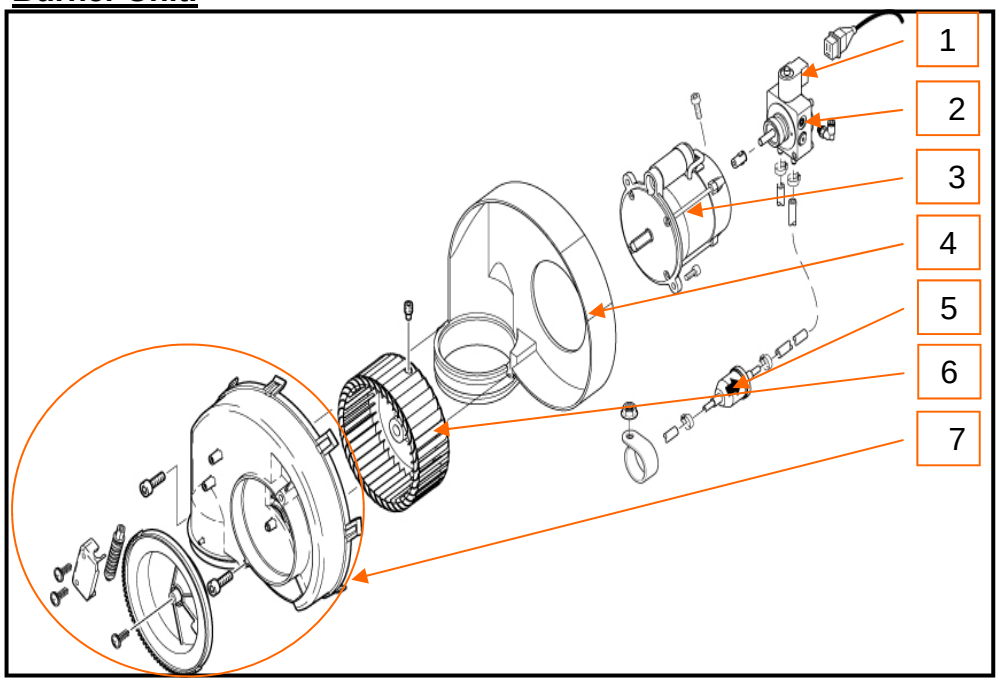


Fig.F.44: Burner unit.

1. Fuel solenoid
2. Fuel pump
3. Burner motor
4. Burner housing
5. Fuel filter
6. Fan
7. Fan cover

Heat exchanger

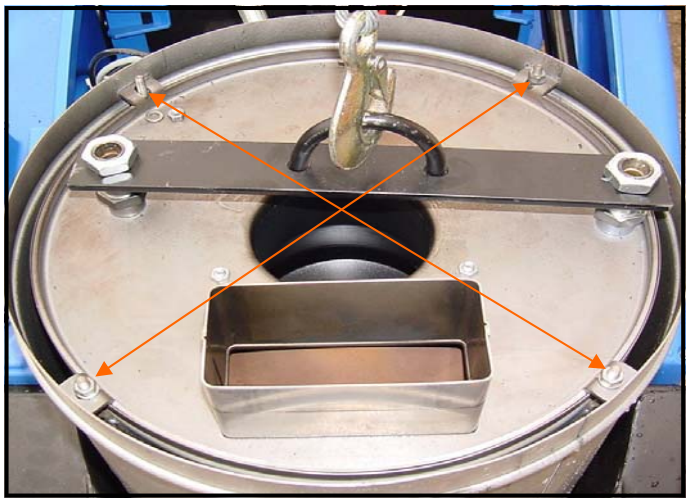


Fig.F.45: Dismounting coil

Remove the outer top cover and mount the lifting tool over the two coil ends and fix it with the nuts. Dismount the 4 nuts
"Arrows"and hook up the crane and lift out the coil.
When landing on the floor press over to the side or protect the machine by a piece of cardboard.

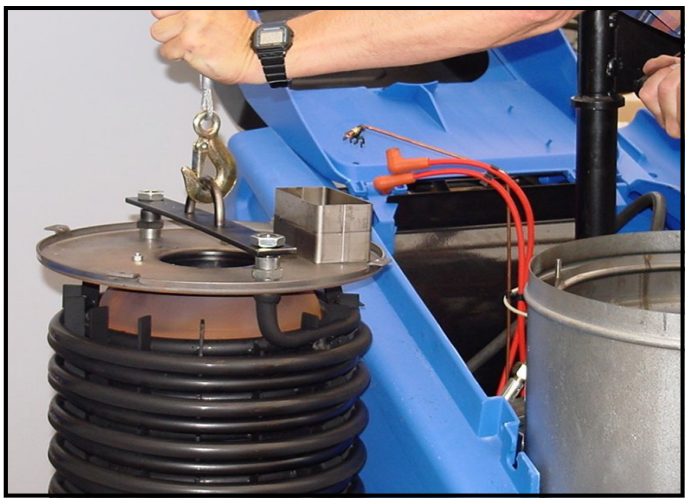


Fig.F.46: Dismounting coil

Attention : Be aware of the fact that the machine can tip over. Keep the coil close to the machine.

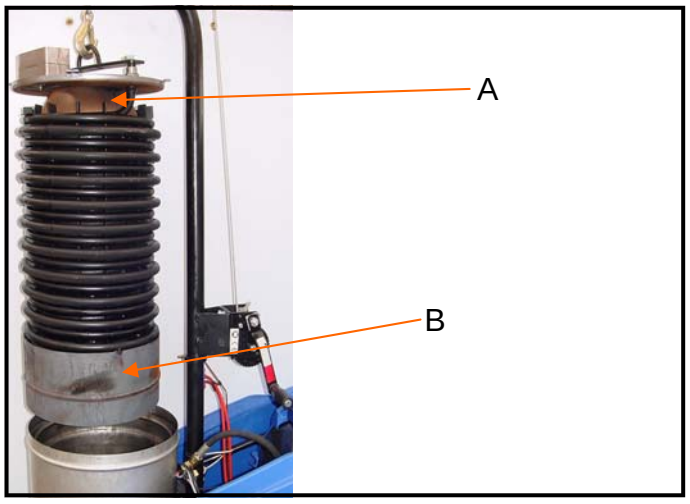


Fig.F.47: Dismounting coil

Check the flame tube A and B. It is important that they are solid and whole.

Fig.F.48: Inspection of coil

Clean up deposits and change the isolation if needed.

Torque specifications

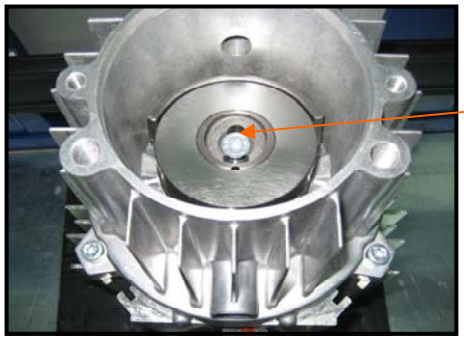


Fig.G.01: Wobble disc

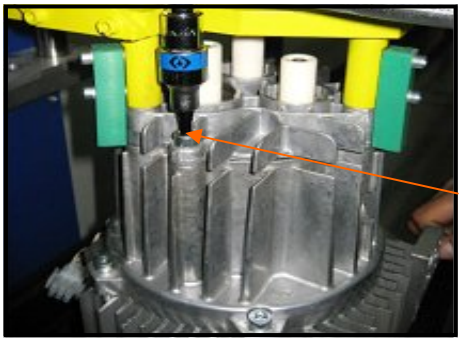


Fig.G.02: Cylinder block

Fig.G.03: Cylinder head

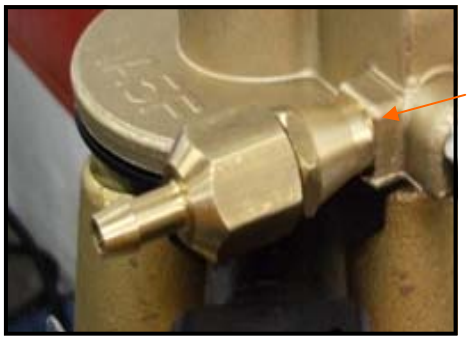


Fig.G.04: Venting valve

Fig.G.05: By-pass housing

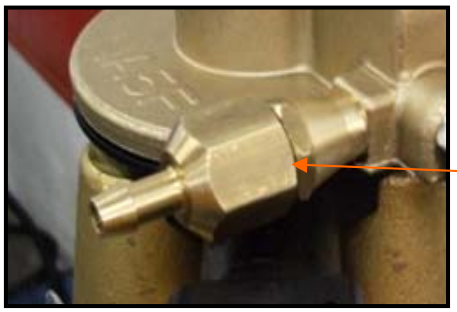


Fig.G.06: Venting valve

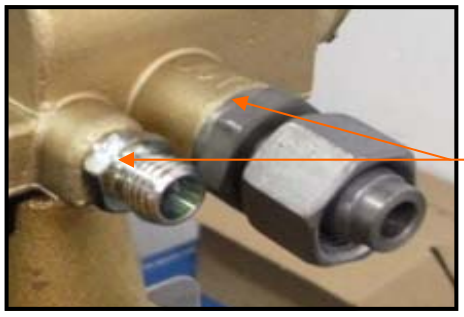


Fig.G.07: Outlet fittings

Fig.G.08: Water regulation

Adjustment of by-pass system.

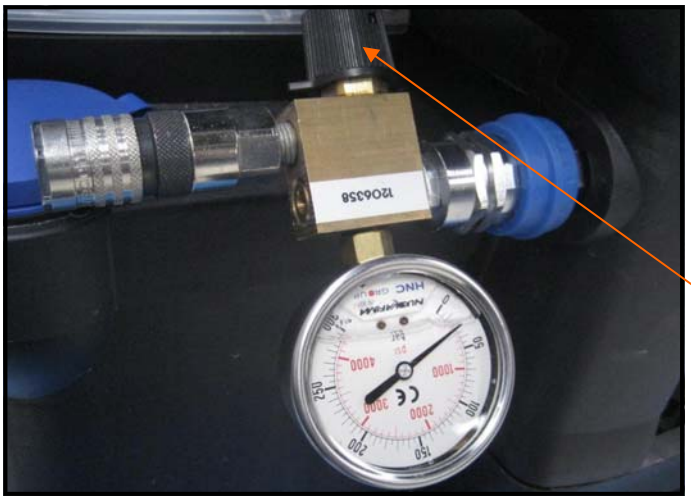


Fig.G.09: Pressure gauge

Connect test pressure gauge 1206358 to the machine water outlet.

Fig.G.10: Test tap

Machines with hose reel:
Connect extension hose 301001311and test pressure gauge 1206358 to the machine water outlet

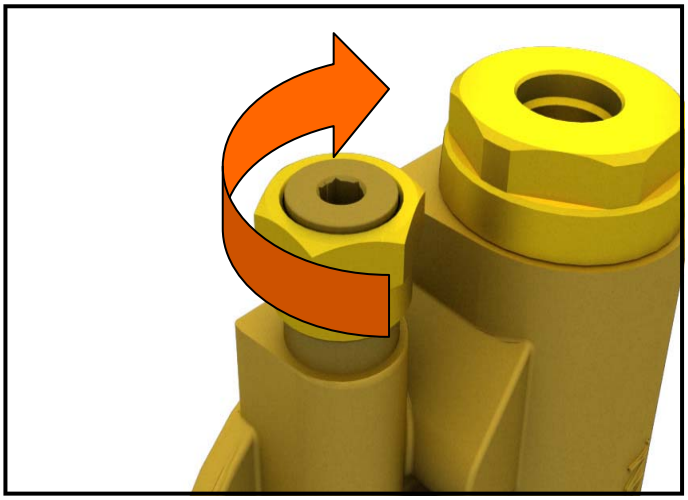


Fig.G.11: Safety valve

Check the working pressure in data sheets chapter B.

Close the safety valve completely.

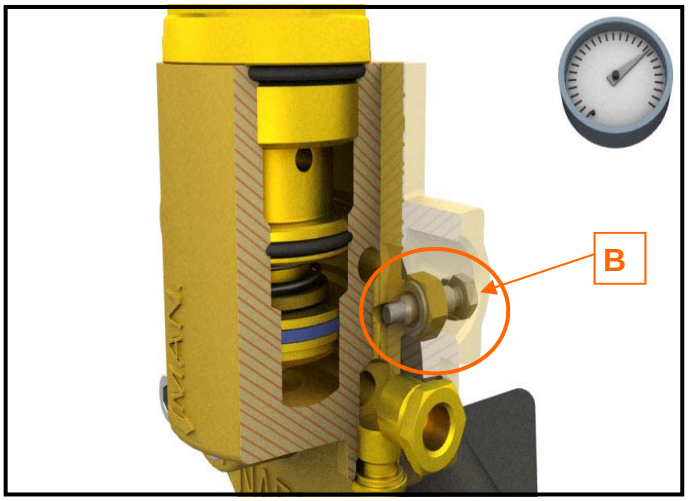


Fig.G.12: Pressure bolt

Turn pressure bolt (B . Fig. G12) 1 to 2 turns out, to ensure that a too high cut off pressure will not damage the by-pass valve.

Adjust the test tap (A. Fig G.09 & G.10) and the pressure bolt (B) so it couples 20-30 bars higher than working pressure, when the pressure gun is closed— CUT OFF PRESSURE. After the cut off pressure is reached the machine runs in by-pass untill the pressure gun is opened.

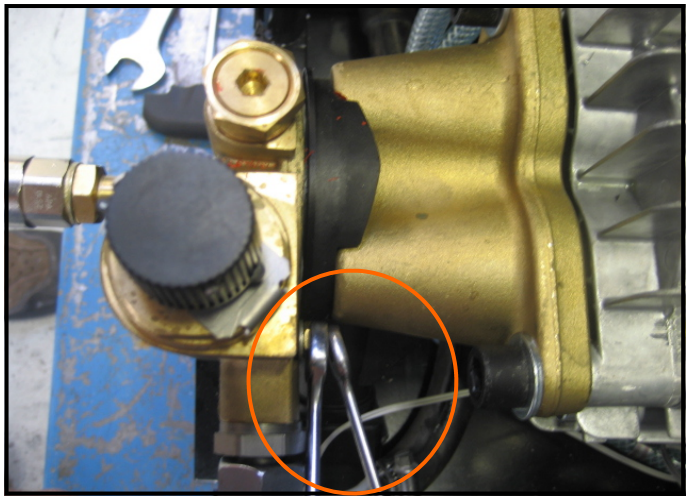


Fig.G.13: Pressure bolt

When adjustment is done, lock the bolt with the counter nut.
NOTE: If the cut off pressure is adjusted too high > 60 bar higher than working pressure, the by-pass valve can be damaged due to fast and hard movements during the change from working pressure to by-pass pressure.

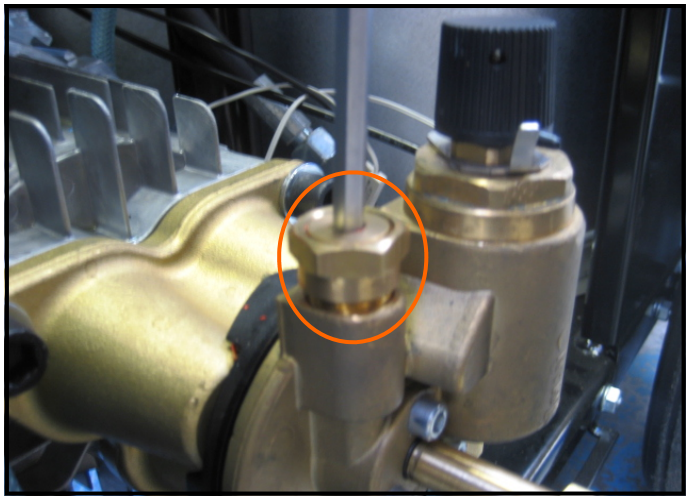


Fig.G.14: Safety valve

Let the machine run 5 bars lower than the cut off pressure (working + adjustment) and adjust the safety valve out (Counter clockwise) until it couples out (go into bypass). Then you turn the adjusting “screw” a ½ turn back (Clockwise) and lock it with the counter nut.
Open and close the pressure gun a couple of times to check the adjustment.
Finalize the adjustment with locking glue/paint on both the bolt and the safety valve.

Burner settings.

Note: Higher CO2 concentrations at different barometric pressure, altitude or temperature and poor quality of the used fuel can lead to faster soot deposition on the heating coil of the heat exchanger.

Preparation
1. Set the fuel pressure.
2. Let the machine run in "Hot water" mode for at least two minutes so that it reaches operating temperature and meaningful results can be measured.
Note: Machines that are primarily used for a brief period should run continuously for about half an hour in "Hot water" mode before an exhaust measurement.

Measurement
3. Determine the soot rating with a soot pump and soot rating reference scale. The figure should not exceed "1". Otherwise, open the air flap a little and repeat the measurement. Repeat the procedure until the specified value is obtained.
.
4. Then the CO2 content in the exhaust, the intake and exhaust temperature are determined. This can be done with conventional meters or with an electronic meter like the TESTO 327, which measures and displays all relevant data.
If the measured value is too low, close the air flap a little and check the soot rating and Co2 content again.
Repeat all settings until all specified values are obtained.
5. Finally seal the set screw (arrow A) of the air flap with varnish.

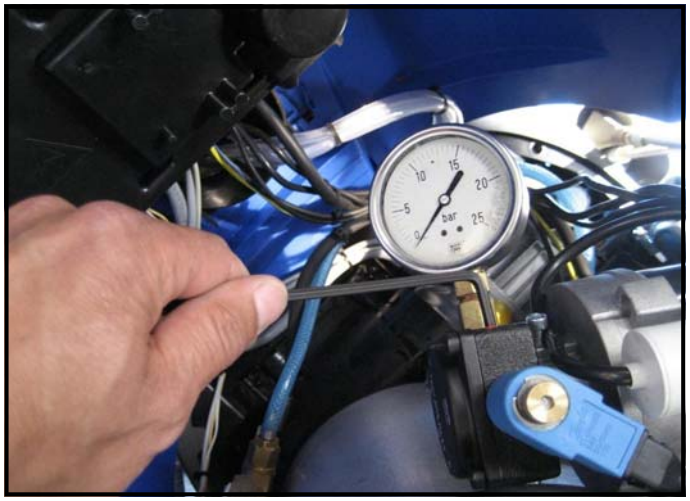


Fig.G.15: Fuel pressure setting.

- Mount pressure gauge on the fuel pump.
- Adjust the fuel pressure according to the values in Technical data chapter A.

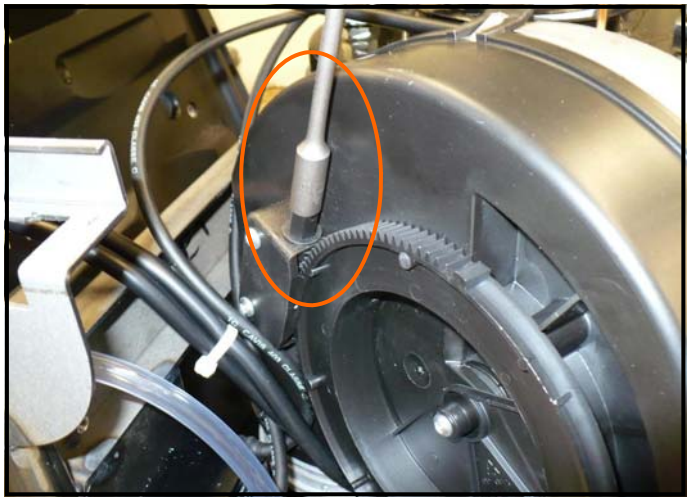


Fig.G.16: Air flap.

- The air flap on the side of the burner fan is adjusted by a self-locking spindle on a set screw. Turning clockwise increases the air intake, turning counterclockwise reduces it.

Burner settings.

Fig.G.17: Soot raiting

Determine the soot rating with a soot pump (1) and soot rating reference scale. The figure should not exceed "1". Otherwise, open the air flap (Fig.G.07) a little and repeat the measurement. Repeat the procedure until the specified value is obtained.

Fig.G.18: Burner measurements.

The CO2 content in the exhaust, the intake and exhaust temperature are determined. This can be done with conventional meters or, as in Fig. G.08, with an electronic meter like the TESTO 327 (4), which measures and displays all relevant data.
If the measured value is too low, close the air flap (Fig.G.06) a little and check the soot rating and Co2 content again.

Service time setting.

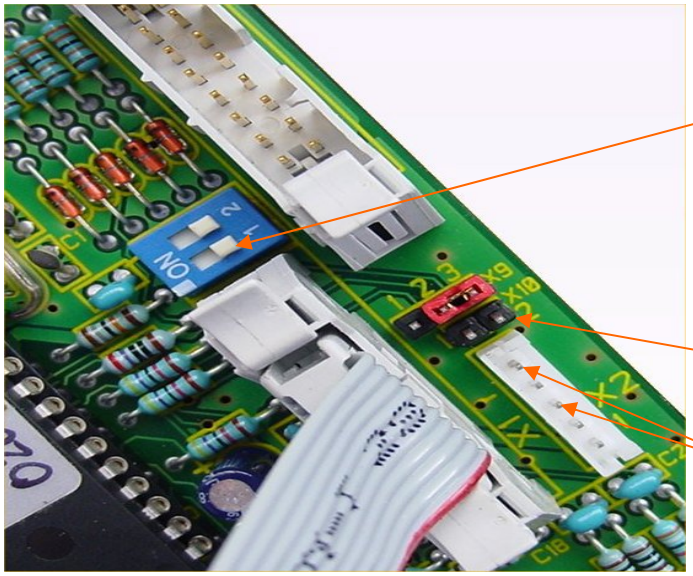
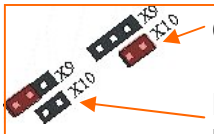


Fig.G.19: Service settings.

Change temperature display.
When 1 is on the temp. Is shown in Fahrenheit (NB: it's not possible to cancel by-pass time when temp. display is set on Fahrenheit).

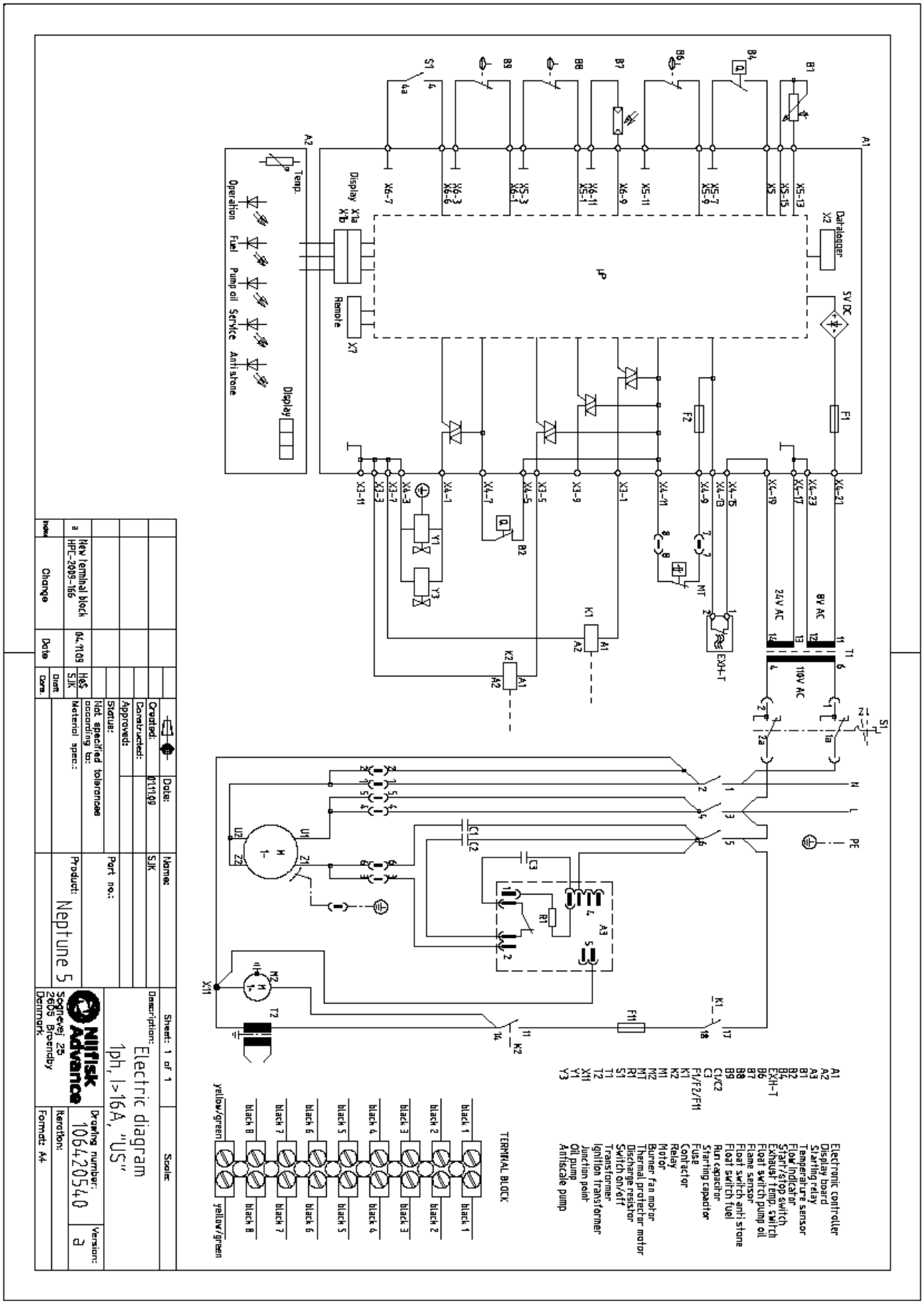


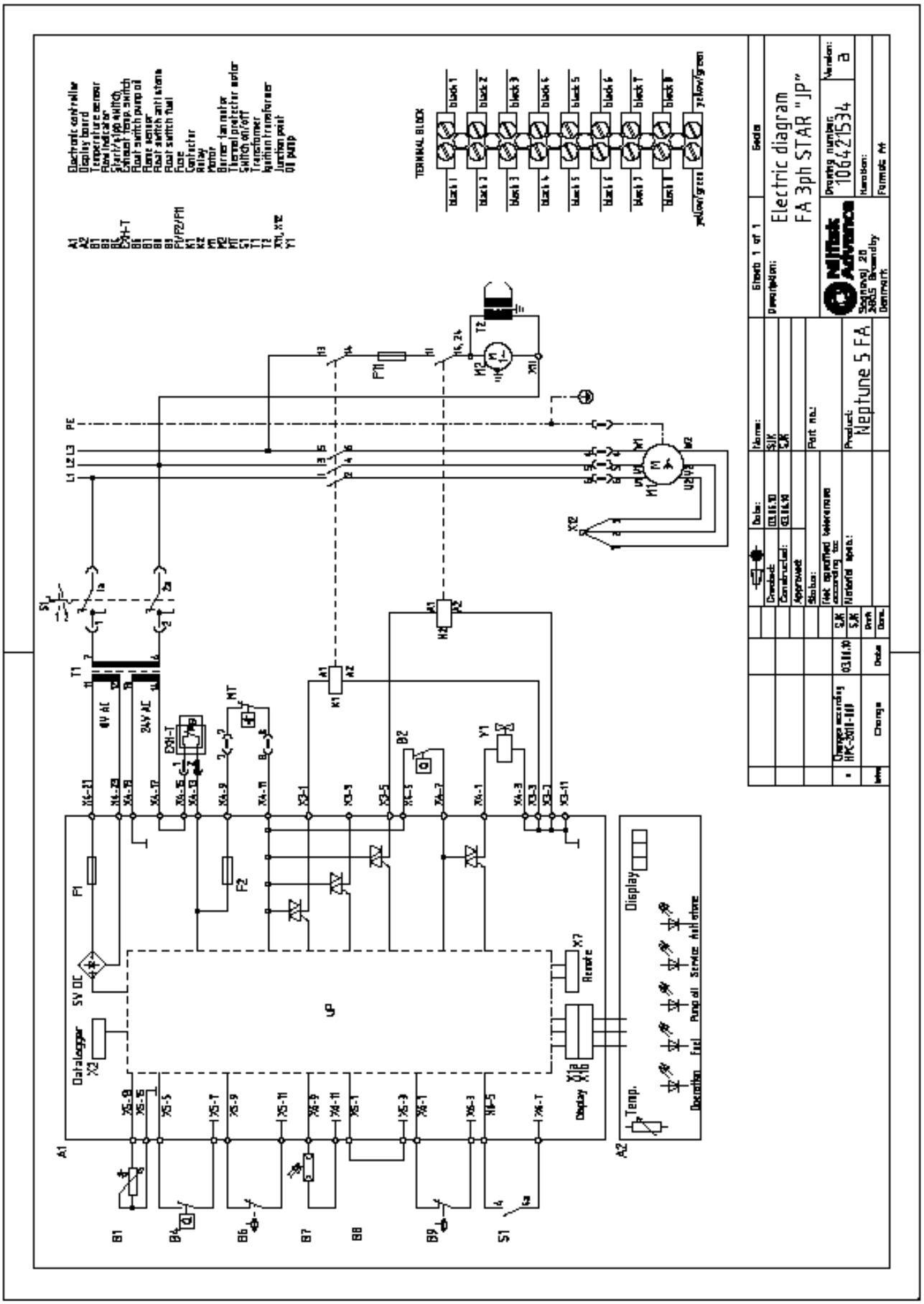
Cancel by-pass time

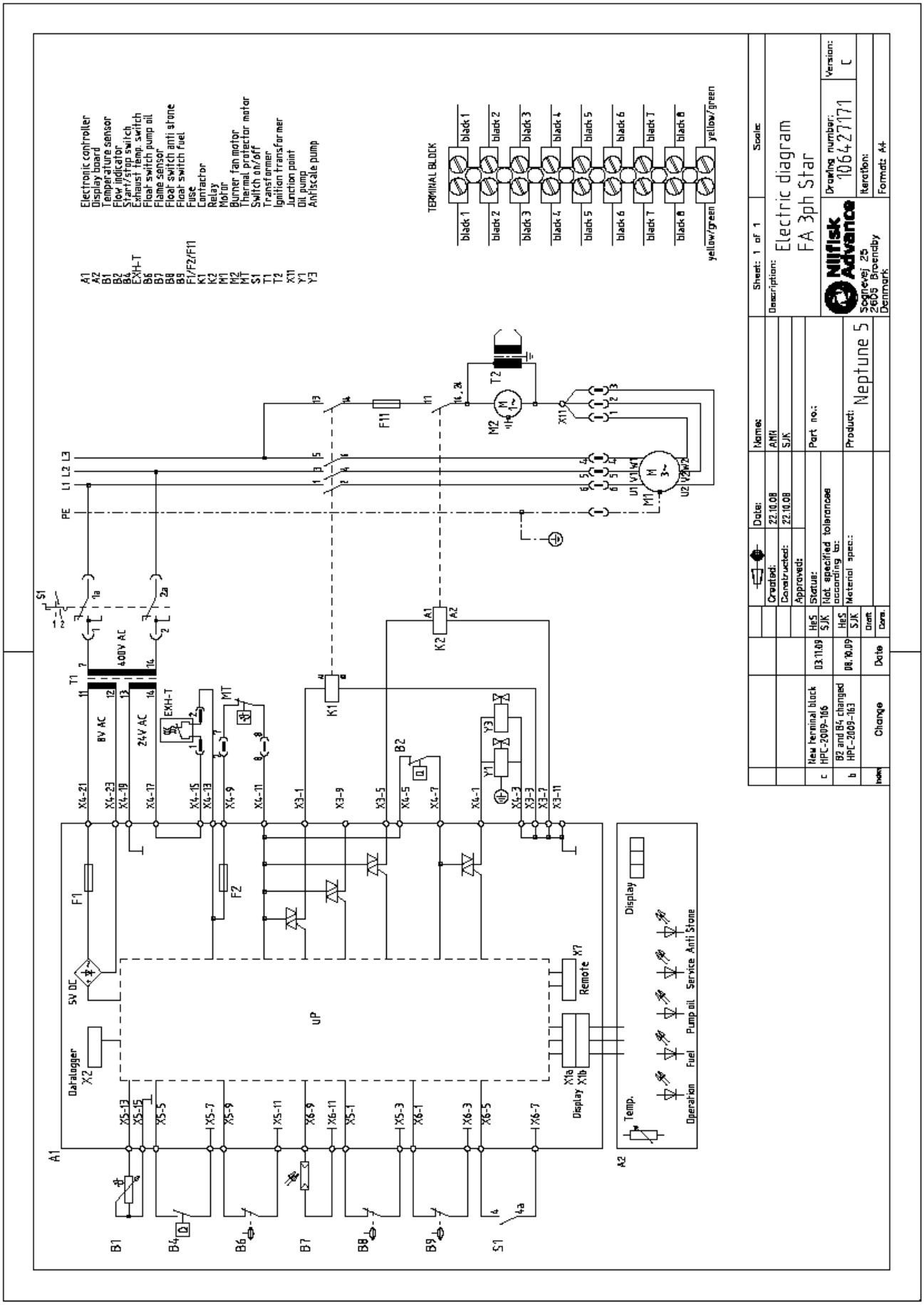
Factory setting without hour display.

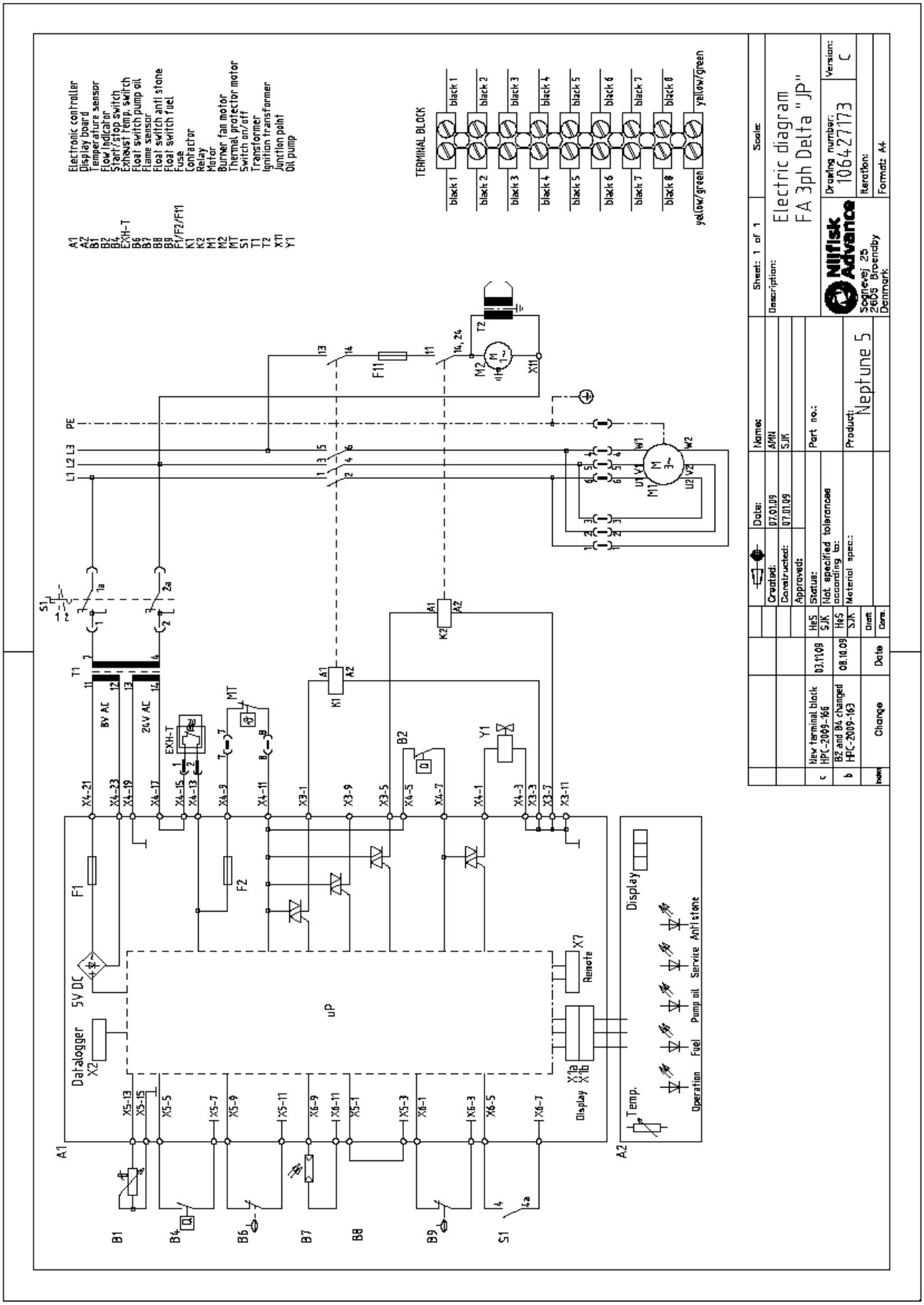
Hour display setting.

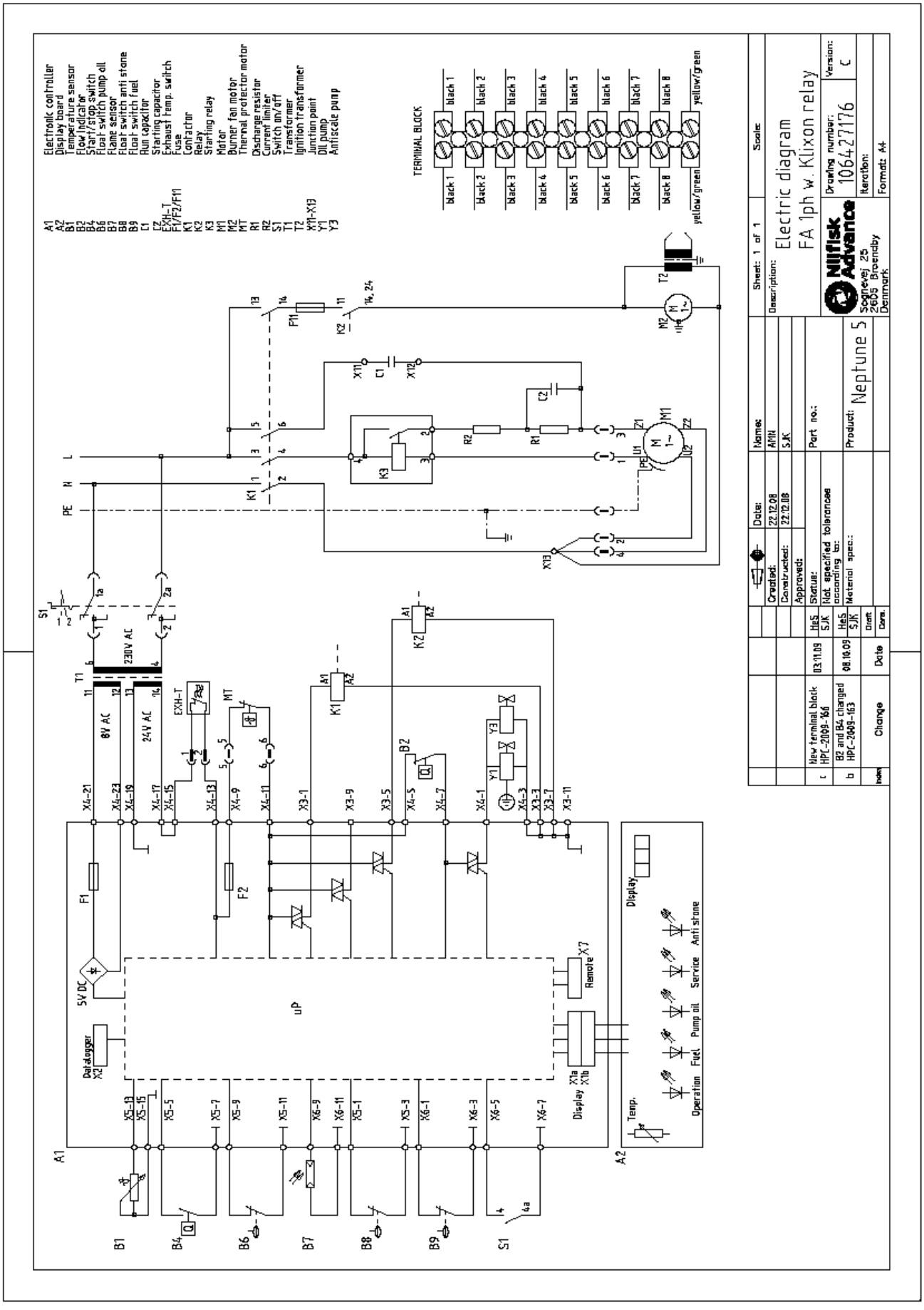
Bridges 3 and 5 to change service interval.
With the temperature adjustment knob100 to 600 hours.
Change to hotwater mode to set new setting.

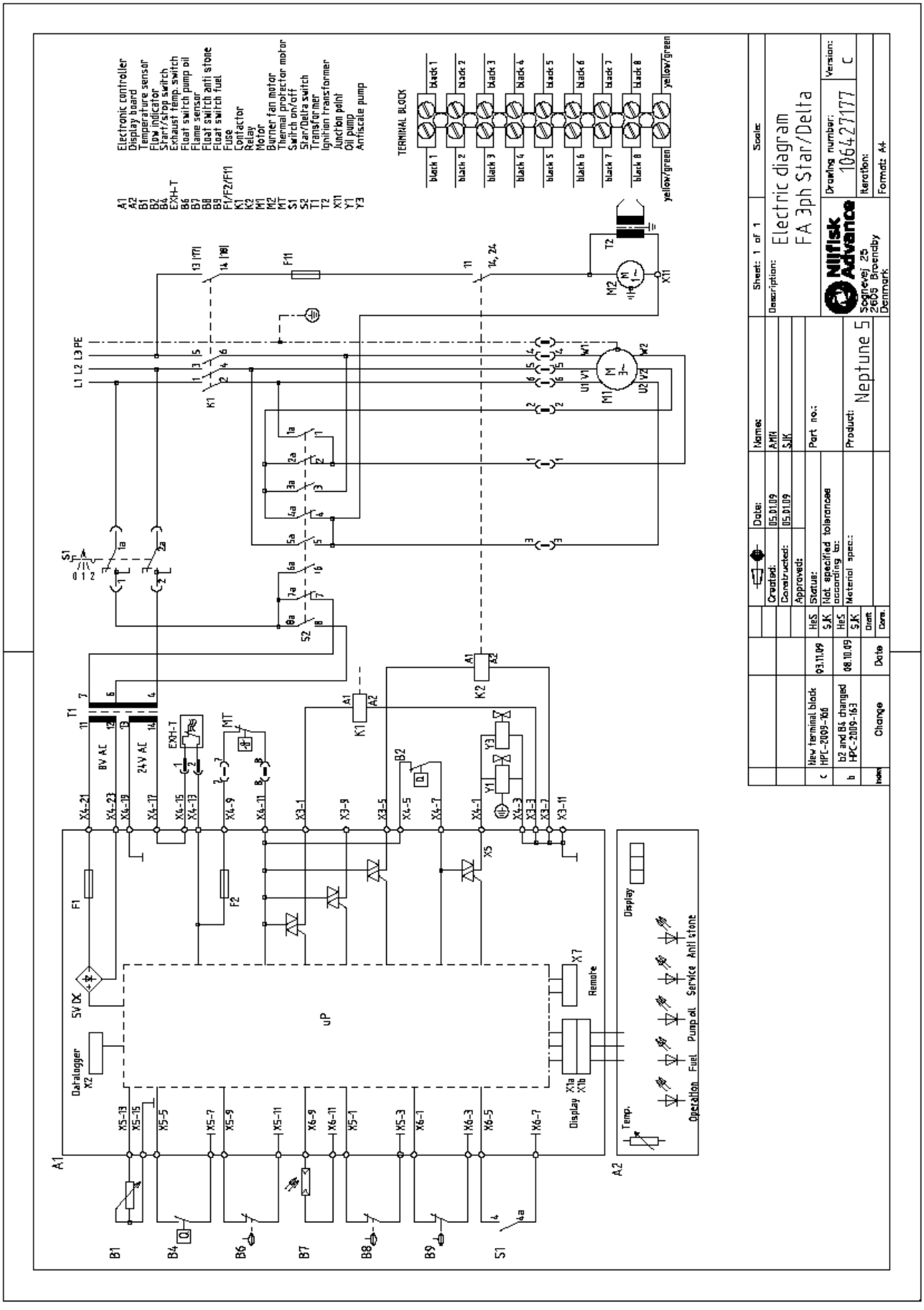

Electronic controller
Display board
Starting relay
Temperature sensor
Flow indicator
Start/stop switch
Exhaust temp. switch
Float switch pump oil
Flame sensor
Float switch anti stone
Float switch fuel
Run capacitor
Starting capacitor
Fuse
Contactor
Relay
Motor
Burner fan motor
Thermal protector motor
Discharge resistor
Switch on/off
Transformer
Ignition transformer
Junction point
Oil pump
Antiscale pump
TERMINAL BLOCK
Electric diagram
1ph, I>16A, "US"
Neptune 5
Nilfisk Advance
Sognevej 25
2605 Brøndby
Denmark
Drawing number: 106420540
Version: a
Format: A4
Sheet: 1 of 1
Scale:
Change
Date
Initials
New terminal block HPC-2009-166
04.11.09
HeS SJK

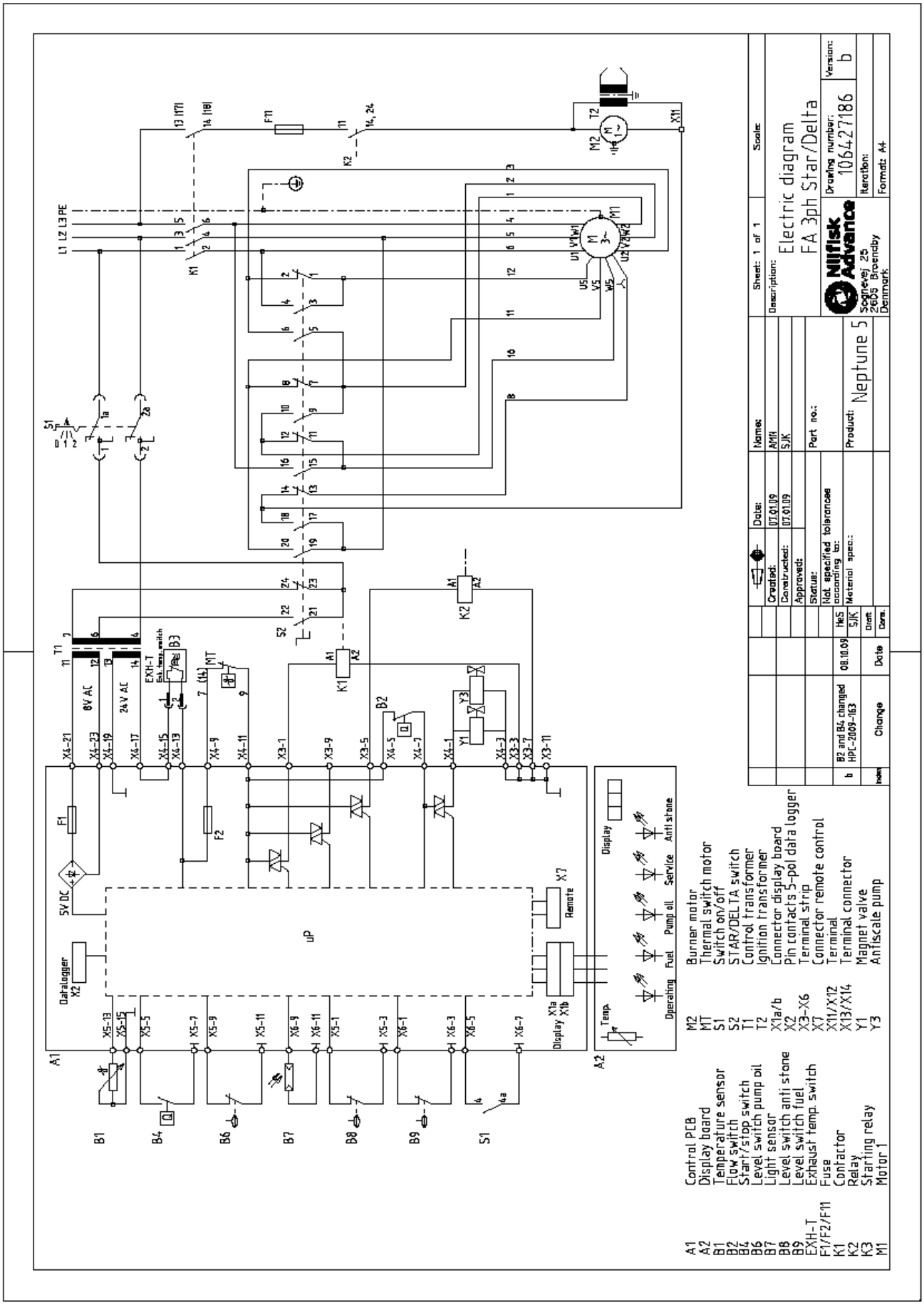

Electric diagram
FA 3ph STAR "JP"
Neptune 5 FA
Drawing number:
10642153 4
Sheet 1 of 1
Scale
Date:
Name:
Part no.:
Product:
Material specified elsewhere according to:
Material spec.:
Approved
Status:
Checked:
Constructed:
Description
Change
Date
Dim.
Terminal block
Display
Remote
Datalogger
Temp.
Pump oil
Service
Antifreeze
Fuel
Burner
Ignition
Description
Danfoss A/S
Nilfisk Advance
Sognevej 20
2605 Brøndby
Denmark

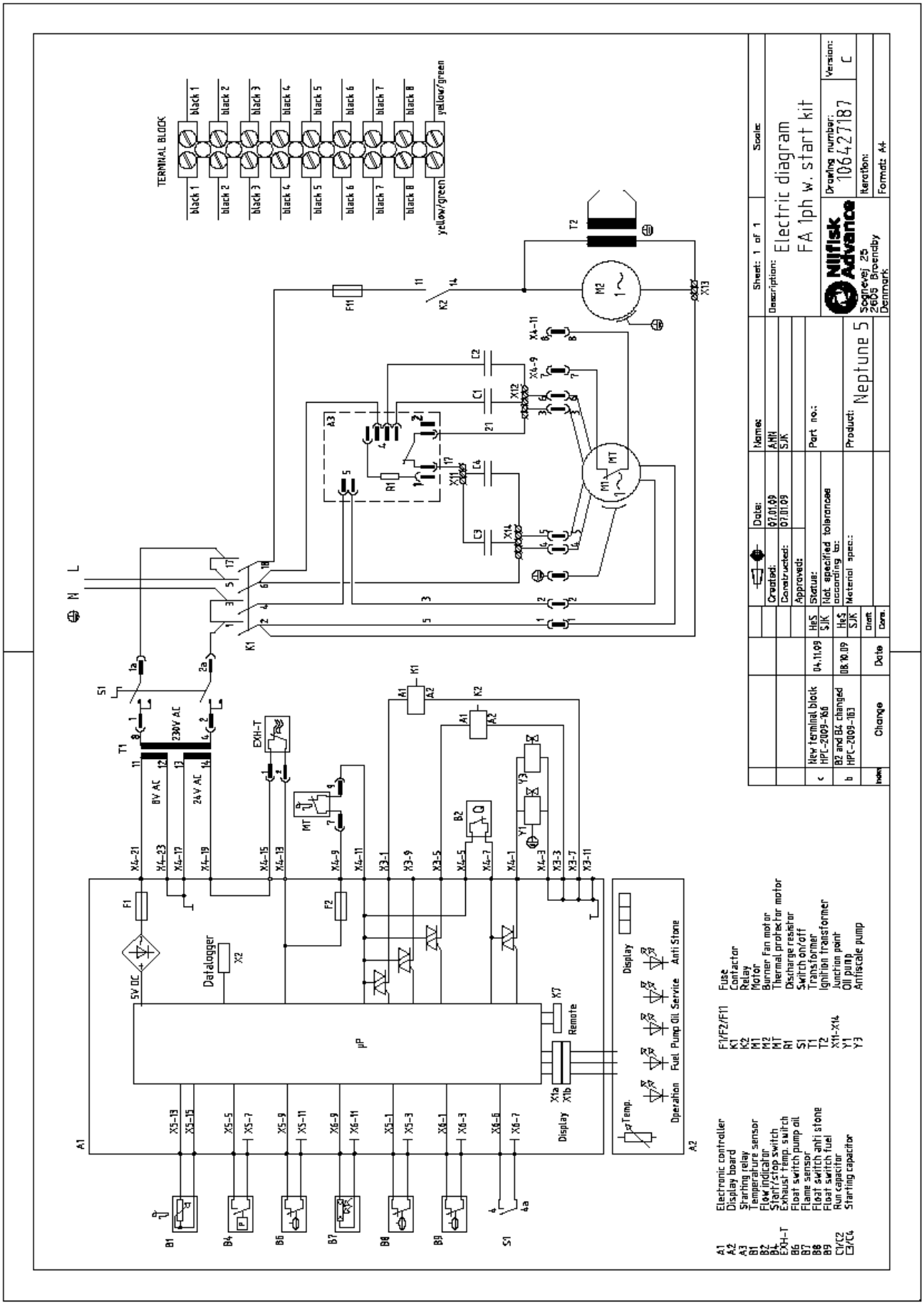

Electric diagram
FA 3ph Star
Neptune 5
Nilfisk Advance
Sognevej 25
2605 Brøndby
Denmark
Drawing number: 106427171
Version: C
Sheet: 1 of 1
Format: A4
Electronic controller
Display board
Temperature sensor
Flow indicator
Start/stop switch
Exhaust temp. switch
Floal switch pump oil
Flame sensor
Floal switch anti stone
Floal switch fuel
Fuse
Contactor
Relay
Motor
Burner fan motor
Thermal protector motor
Switch on/off
Transformer
Ignition transformer
Junction point
Oil pump
Antiscale pump
TERMINAL BLOCK
black 1
black 2
black 3
black 4
black 5
black 6
black 7
black 8
yellow/green
L1 L2 L3
PE
400V AC
230V AC
24V AC
5V DC
uP
Datalogger X2
Remote X7
Display X1a X1b
Temp.
Operation
Fuel
Pump oil
Service
Anti Stone
Display
F1
F2
F11
T1
T2
K1
K2
S1
EXH-T
MT
B1
B2
B4
B6
B7
B8
B9
M1
M2
Y1
Y3
New terminal block HPC-2009-166
B2 and B4 changed HPC-2009-163
Change
Date
Created: 22.10.08 AMH
Constructed: 22.10.08 SJK
Approved:
Part no.:
Material spec.:
Not specified tolerances according to:


Electronic controller
Display board
Temperature sensor
Flow indicator
Start/stop switch
Exhaust temp. switch
Float switch pump oil
Flame sensor
Float switch anti stone
Float switch fuel
Fuse
Contractor
Relay
Motor
Burner fan motor
Thermal protector motor
Switch on/off
Transformer
Ignition transformer
Junction point
Oil pump
TERMINAL BLOCK
black 1
black 2
black 3
black 4
black 5
black 6
black 7
black 8
yellow/green
Electric diagram
FA 3ph Delta "JP"
Nilfisk Advance
Sognevej 25
2605 Brøndby
Denmark
Drawing number: 106427173
Version: C
Sheet: 1 of 1
Format: A4
Product: Neptune 5
Part no.:
Created: 07.01.09 AMN
Constructed: 07.01.09 SJK
Approved:
Status: Not specified tolerances according to:
Material spec.:
c New terminal block HPC-2009-166 03.11.09 HeS SJK
b B2 and B4 changed HPC-2009-163 08.10.09 HeS SJK
Change Date Draft Conv.
uP
Datalogger
Display
Temp.
Remote
Operation
Fuel
Pump oil
Service
Anti stone
5V DC
EXH-T
24V AC
8V AC


Electric diagram
FA 1ph w. Klixon relay
Neptune 5
Nilfisk Advance
Sognevej 25
2605 Brøndby
Denmark
Drawing number: 106427176
Version: C
Sheet: 1 of 1
Format: A4
Electronic controller
Display board
Temperature sensor
Flow indicator
Start/stop switch
Float-switch pump oil
Flame sensor
Float-switch anti stone
Float-switch fuel
Run capacitor
Starting capacitor
Exhaust temp. switch
Fuse
Contactor
Relay
Starting relay
Motor
Burner fan motor
Thermal protector motor
Discharge resistor
Current limiter
Switch on/off
Transformer
Ignition transformer
Junction point
Oil pump
Antiscale pump
TERMINAL BLOCK
black 1
black 2
black 3
black 4
black 5
black 6
black 7
black 8
yellow/green
230V AC
8V AC
24V AC
5V DC
µP
Datalogger
Remote
Display
Temp.
Operation
Fuel
Pump oil
Service
Anti stone
B1
B4
B6
B7
B8
B9
S1
F1
F2
K1
K2
K3
M1
M2
MT
EXH-T
T1
T2
Y1
Y3
C1
C2
R1
R2
New terminal block HPC-2009-166
B2 and B4 changed HPC-2009-163
Change
Date
Created:
Constructed:
Approved:
Material spec.:
Part no.:


Electric diagram
FA 3ph Star/Delta
Neptune 5
Nilfisk Advance
Sognevej 25
2605 Brøndby
Denmark
Drawing number: 106427177
Version: C
Sheet: 1 of 1
Format: A4
Electronic controller
Display board
Temperature sensor
Flow indicator
Start/Stop switch
Exhaust temp. switch
Float switch pump oil
Flame sensor
Float switch anti stone
Float switch fuel
Fuse
Contactor
Relay
Motor
Burner fan motor
Thermal protector motor
Switch on/off
Star/Delta switch
Transformer
Ignition transformer
Junction point
Oil pump
Antiscale pump
TERMINAL BLOCK
uP
Datalogger
Remote
Display
Temp.
Operation
Fuel
Pump oil
Service
Anti stone
5V DC
8V AC
24V AC
L1 L2 L3 PE
New terminal block HPC-2009-166
b2 and B4 changed HPC-2009-163


Electric diagram
FA 3ph Star/Delta
Nilfisk Advance
Sognevej 25
2605 Brøndby
Denmark
Drawing number:
10642186
Version:
b
Product:
Neptune 5
Part no.:
Sheet: 1 of 1
Scale:
Format: A4
Control PCB
Display board
Temperature sensor
Flow switch
Start/stop switch
Level switch pump oil
Light sensor
Level switch anti stone
Level switch fuel
Exhaust temp. switch
Fuse
Contactor
Relay
Starting relay
Motor 1
Burner motor
Thermal switch motor
Switch on/off
STAR/DELTA switch
Control transformer
Ignition transformer
Connector display board
Pin contacts 5-pol data logger
Terminal strip
Connector remote control
Terminal
Terminal connector
Magnet valve
Antiscale pump
uP
Datalogger
Display
Remote
Temp.
Operating
Fuel
Pump oil
Service
Anti stone


TERMINAL BLOCK
black 1
black 2
black 3
black 4
black 5
black 6
black 7
black 8
yellow/green
Electric diagram
FA 1ph w. start kit
Nilfisk Advance
Sognevej 25
2605 Brøndby
Denmark
Drawing number: 106427187
Version: C
Sheet: 1 of 1
Scale
Format: A4
Product: Neptune 5
Created: 07.01.09 AMN
Constructed: 07.01.09 SJK
Approved:
Part no.:
Status: Not specified tolerances according to:
Material spec.:
Date: 04.11.09 08.10.09
Name: HeS SJK HeS SJK
Draft Date
Check
Change
Item
c New terminal block HPC-2009-K6
b B2 and B4 changed HPC-2009-163
Datalogger
Display
Anti Stone
Operation
Fuel Pump
Oil Service
Remote
Temp.
μP
A1 Electronic controller
A2 Display board
A3 Starting relay
B1 Temperature sensor
B2 Flow indicator
B4 Start/stop switch
EXH-T Exhaust temp. switch
B6 Float switch pump oil
B7 Flame sensor
B8 Float switch anti stone
B9 Float switch fuel
C1/C2 Run capacitor
C3/C4 Starting capacitor
F1/F2/F11 Fuse
K1 Contactor
K2 Relay
M1 Motor
M2 Burner fan motor
MT Thermal protector motor
R1 Discharge resistor
S1 Switch on/off
T1 Transformer
T2 Ignition transformer
X11-X14 Junction point
Y1 Oil pump
Y3 Antiscale pump

Notes